

Tankless Water Heater System Design Manual

Plumbing schematics for single and multiple tankless water heaters in use with domestic systems, recirculation, and storage tanks.

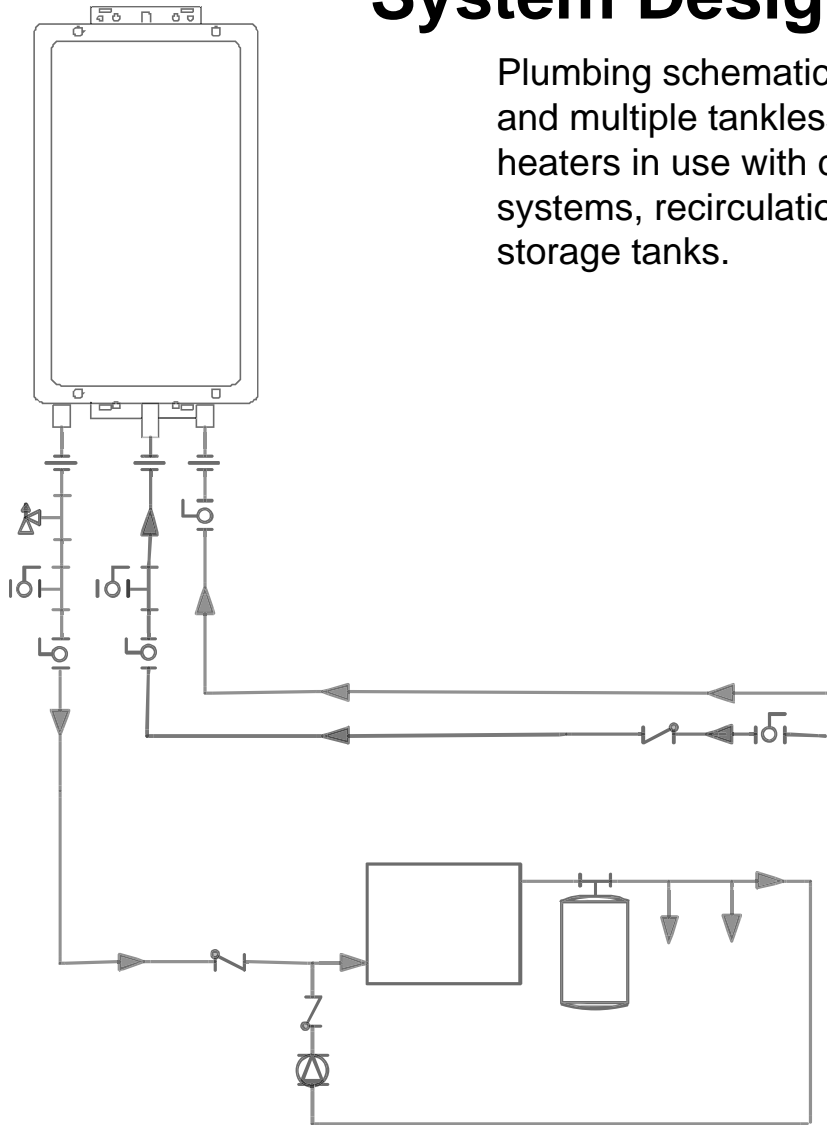


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Approvals

ATI-305-N	GTS-305-NI	GT-305-NI
ATI-305-P	GTS-305-PI	GT-305-PI
ATO-305-N	GTS-305-NE	GT-305-NE
ATO-305-P	GTS-305-PE	GT-305-PE
ATI-505-N	GTS-505-NI	GT-505-NI
ATI-505-P	GTS-505-PI	GT-505-PI
ATO-505-N	GTS-505-NE	GT-505-NE
ATO-505-P	GTS-505-PE	GT-505-PE
ATI-705-N	GTS-705-NI	GT-705-NI
ATI-705-P	GTS-705-PI	GT-705-PI
ATO-705-N	GTS-705-NE	GT-705-NE
ATO-705-P	GTS-705-PE	GT-705-PE
ATI-705A-N	GTS-705-NIA	AGT-705-NI
ATI-705A-P	GTS-705-PIA	AGT-705-PI
ATO-705A-N	GTS-705-NEA	AGT-705-NE
ATO-705A-P	GTS-705-PEA	AGT-705-PE

The models listed in this manual have received the following certifications except where noted:



Certified to applicable U.S. standards for appliances using gas or other petroleum fuel.



Energy efficiency certified by Gas Appliance Manufacturers Association (GAMA), www.gamanet.org



Certified to applicable Canadian standards for appliances using gas or other petroleum fuel.

Met the California Energy Commission (CEC) standards



Certified by the Uniform Plumbing Code (UPC)

Approved by the Commonwealth of Massachusetts

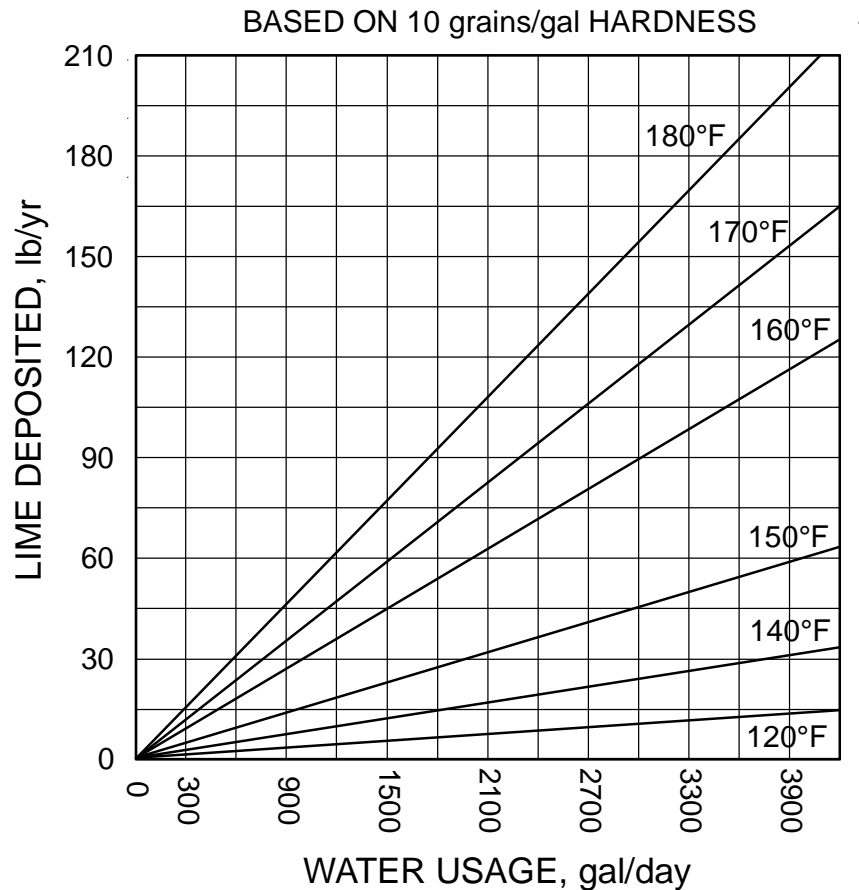


Certified by National Sanitation Foundation (NSF), www.nsf.org
(indoor models must use the NSF approved top guard)

Received New York City's Material and Equipment Acceptance (MEA)

Water Quality and Scale

A complete water analysis and an understanding of system requirements are needed to protect the tankless water heaters and water heating systems from scale. Water analysis shows whether water is hard or soft. Hard water, unless treated, will cause scaling or liming of the heat exchanger. The rate of scaling increases with temperature and usage because calcium carbonate and other scaling compounds lose solubility (fall out of solution) at higher temperatures. For example, for every 20°F over 140°F, the rate of scale increases by a factor of 2 (See figure below). Reference target water quality levels found in the operation / installation manual and consider water treatment if these levels are exceeded. *



*Source 2003 ASHRAE Handbook HVAC Applications

Pump Sizing for Circulation

1. Use the chart below or one appropriate for your conditions to determine the heat loss in the length of the hot water supply and return piping. For example, 100 ft of 1-1/2 in bare copper tubing results in a heat loss of 5300 Btu/h.

Approximate Heat Loss from Piping at 140 °F Inlet, 70 °F Ambient *

Nominal Size, in.	Bare Copper Tubing, Btu/h-ft	1/2 in. Glass Fiber Insulated Copper Tubing, Btu/h-ft
3/4	30	17.7
1	38	20.3
1-1/4	45	23.4
1-1/2	53	25.4
2	66	29.6
2-1/2	80	33.8
3	94	39.5
4	120	48.4

* Source: 2003 ASHRAE Handbook HVAC Applications

2. Determine the acceptable temperature drop at the last fixture in the loop. For example, if the supply temperature from the water heater is 120 °F (49 °C) and an acceptable temperature at the last fixture is 100 °F (38 °C) then the acceptable temperature drop is 20 °F (7 °C).
3. Calculate the required pump flow rate using the following formula:

$$\text{FLOW RATE (gpm)} = \frac{\text{HEAT LOSS (BTU / h)}}{500 \times \text{ACCEPTABLE TEMPERATURE DROP (°F)}}$$

4. Based on the above calculations select a pump for the type of circulation system you will be utilizing:
 - A). Preferred Method (reference drawing WH-1-RGE) - Reference pump manufacturers flow vs. pressure specifications to select a pump that can provide the flow rate calculated above while overcoming the pressure loss through:
 - Tank water heater (reference manufacturer's information)
 - All building supply and return plumbing in the circulation loop (reference local plumbing codes, standards, or practices)
 - B). Optional Method (WH-1-R) - Reference pump manufacturers flow vs. pressure specifications to select a pump that can provide 3 gpm of flow or the flow rate calculated above, whichever is greater, while overcoming the pressure loss through:
 - Tankless water heater (reference flow vs. pressure curve of the model being used)
 - Optional storage tank (reference manufacturer's information)
 - All building supply and return plumbing in the circulation loop (reference local plumbing codes, standards, or practices)

NOTE: Only use pumps of brass or stainless steel construction. Do not use pumps of iron construction as they will oxidize and clog the inlet filter on the appliance.

Tank Water Heaters in a Circulation Loop

The following applies when using a tank water heater (gas or electric) to provide heat for a circulation loop. Drawing WH-1-RGE is an example.

The heat **output** of the tank must be equal to or greater than the calculated circulation loop heat loss.

(Reference page 6, Step 1 on calculating heat loss).

Electric Tank Water Heater

Since the input and output are the same for an electric tank water heater, this can be expressed as:

$$\text{Electric Tank Input (Kw)} \geq \frac{\text{Circulation loop heat loss (Btu/h)}}{3413}$$

(1 Kilowatt = 3,413 BTU)

Gas Tank Water Heater

When using a gas style water heater, the efficiency of the tank must be taken into account.

$$\text{Available Btu output} = (\text{Btu input of tank}) \times (\text{efficiency}) \geq \text{Circulation loop heat loss (Btu/h)}$$

Example:

30,000 Btu input gas tank
0.62 Efficiency

$$30,000 \times .62 = 18,600 \text{ available Btu output}$$

Additional Guidelines

Tankless water heaters not recovering a storage tank: In applications involving a commercial dishwasher, a hot water circulation loop feeding the dishwasher is required.

Tankless water heater recovering a storage tank: In applications involving a commercial dishwasher, a hot water circulation loop feeding the dishwasher may be required depending on the distance between the dishwasher and the storage tank. Refer to local codes when determining the need for circulation loops to dishwashers.

Pump Sizing for Storage Tank Application

The following applies when using tankless water heaters to recover a storage tank. Drawing WH-1-B is an example.

Tankless water heaters have a pressure loss which must be considered in the system design. Reference the pressure loss curve for the heater model being used to determine the pump size for the desired recovery rate.

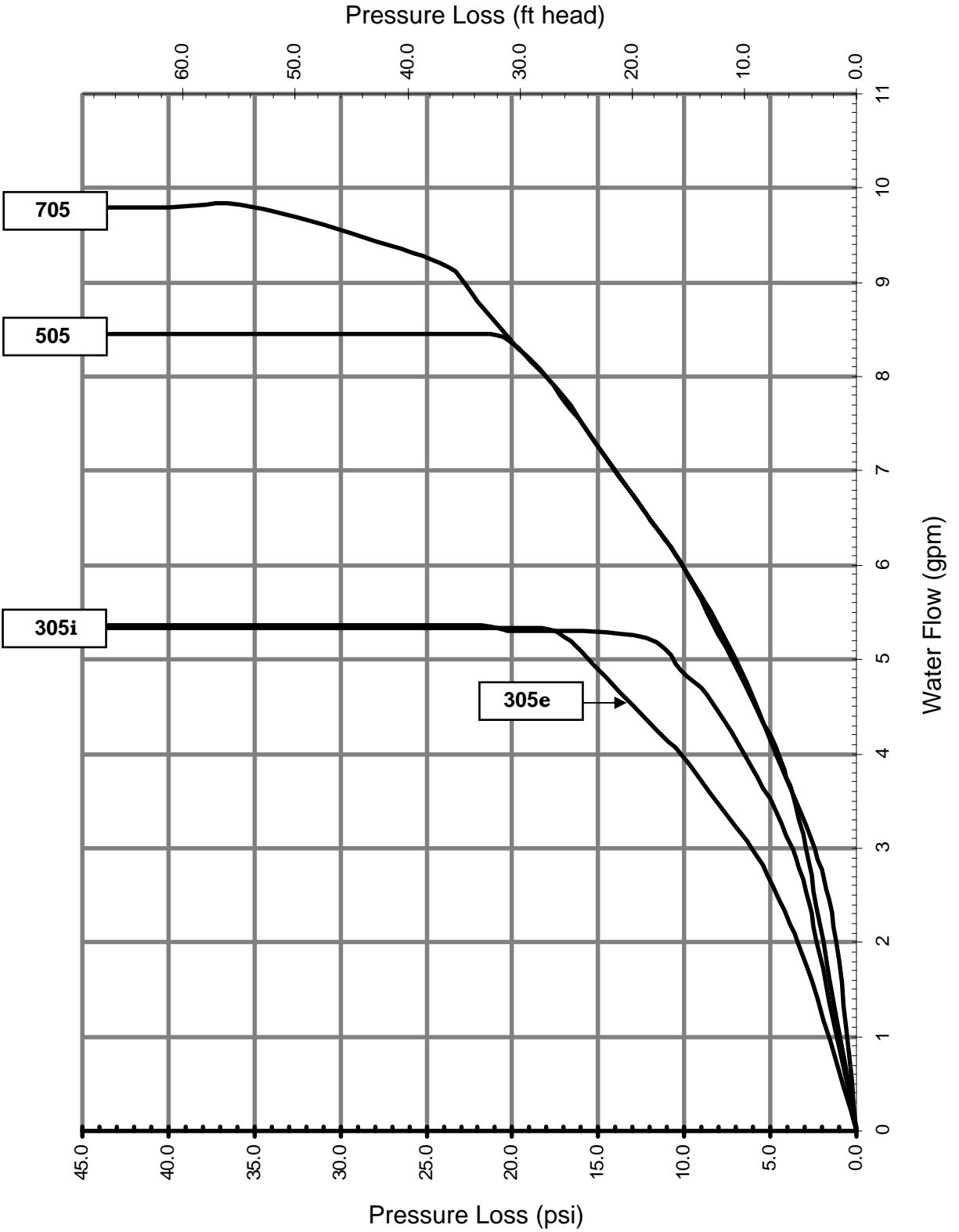
For recommended pump sizes use the table below. Additional pressure losses in plumbing between the Heater(s) and the storage tank must also be taken into consideration.

The specified pump size is to provide maximum recovery of the storage tank. A smaller pump size may be used, but could result in longer recovery time of the tank. Please contact the Tech Services department with any questions on pump sizing.

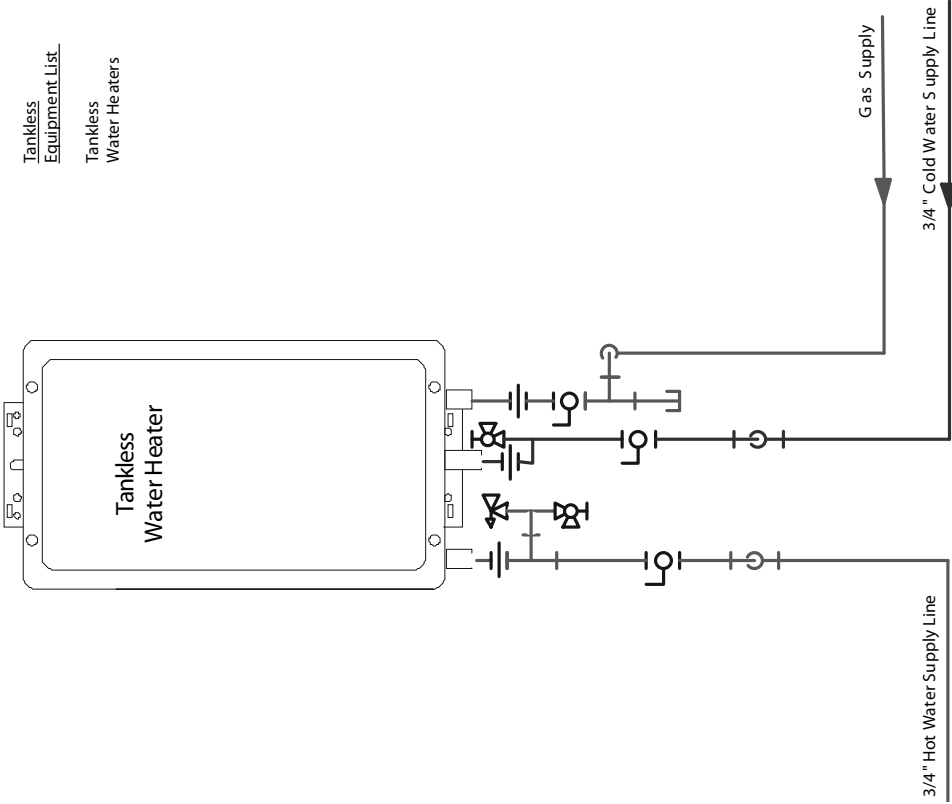
NOTE: Only use pumps of brass or stainless steel construction. Do not use pumps of iron construction as they will oxidize and clog the inlet filter on the appliance.

Pump Flow Requirements		
Number of Tankless Water Heaters	705/505	305
1	6 gpm @ 30' head	5 gpm @ 25' head
2	12 gpm @ 30' head	10 gpm @ 25' head
3	18 gpm @ 30' head	15 gpm @ 25' head
4	24 gpm @ 30' head	20 gpm @ 25' head
5	30 gpm @ 30' head	25 gpm @ 25' head
6	36 gpm @ 30' head	30 gpm @ 25' head
7	42 gpm @ 30' head	35 gpm @ 25' head
8	48 gpm @ 30' head	40 gpm @ 25' head
9	54 gpm @ 30' head	45 gpm @ 25' head
10	60 gpm @ 30' head	50 gpm @ 25' head
11	66 gpm @ 30' head	55 gpm @ 25' head
12	72 gpm @ 30' head	60 gpm @ 25' head
13	78 gpm @ 30' head	65 gpm @ 25' head
14	84 gpm @ 30' head	70 gpm @ 25' head
15	90 gpm @ 30' head	75 gpm @ 25' head

Pressure Loss Curves



Tankless Equipment List	QTY
Tankless Water Heaters	1



Domestic Hot Water - Standard Installation
1 Tankless Water Heater
Preferred Piping Installation

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Drawing Number:
WH-1

Drawing Date:
June 11, 2007

Key

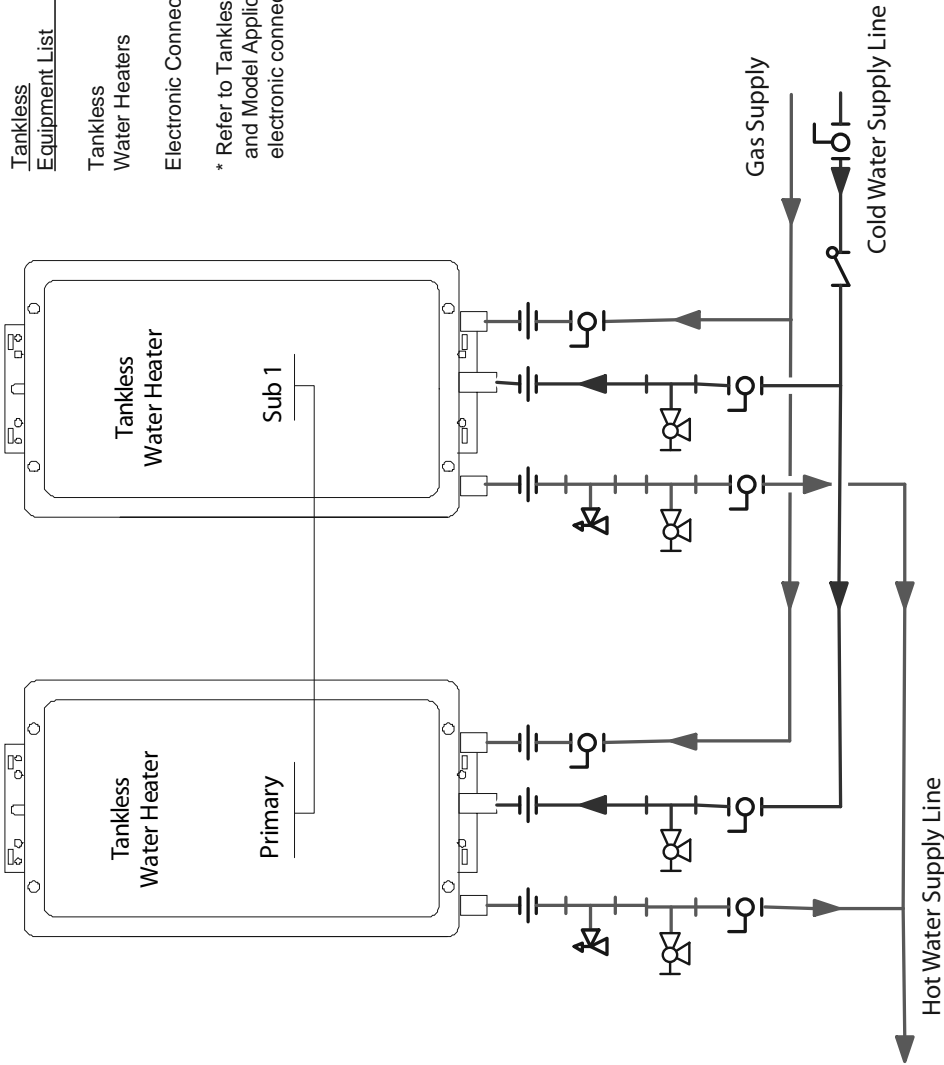
	3/4" Ball Valve		Pressure Regulator
	3/4" Union		Circulating Pump
	Check Valve		Boiler Drain Valve
	Pressure Relief Valve		Solenoid Valve

Tankless
Equipment List QTY

Tankless
Water Heaters 2

Electronic Connection *

* Refer to Tankless Accessories
and Model Applicability for
electronic connection details.



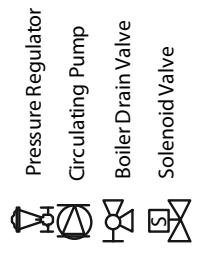
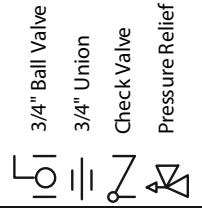
**Domestic Hot Water - Standard Installation
2 Tankless Water Heaters
Preferred Piping Installation**

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Drawing Number:
WH-2

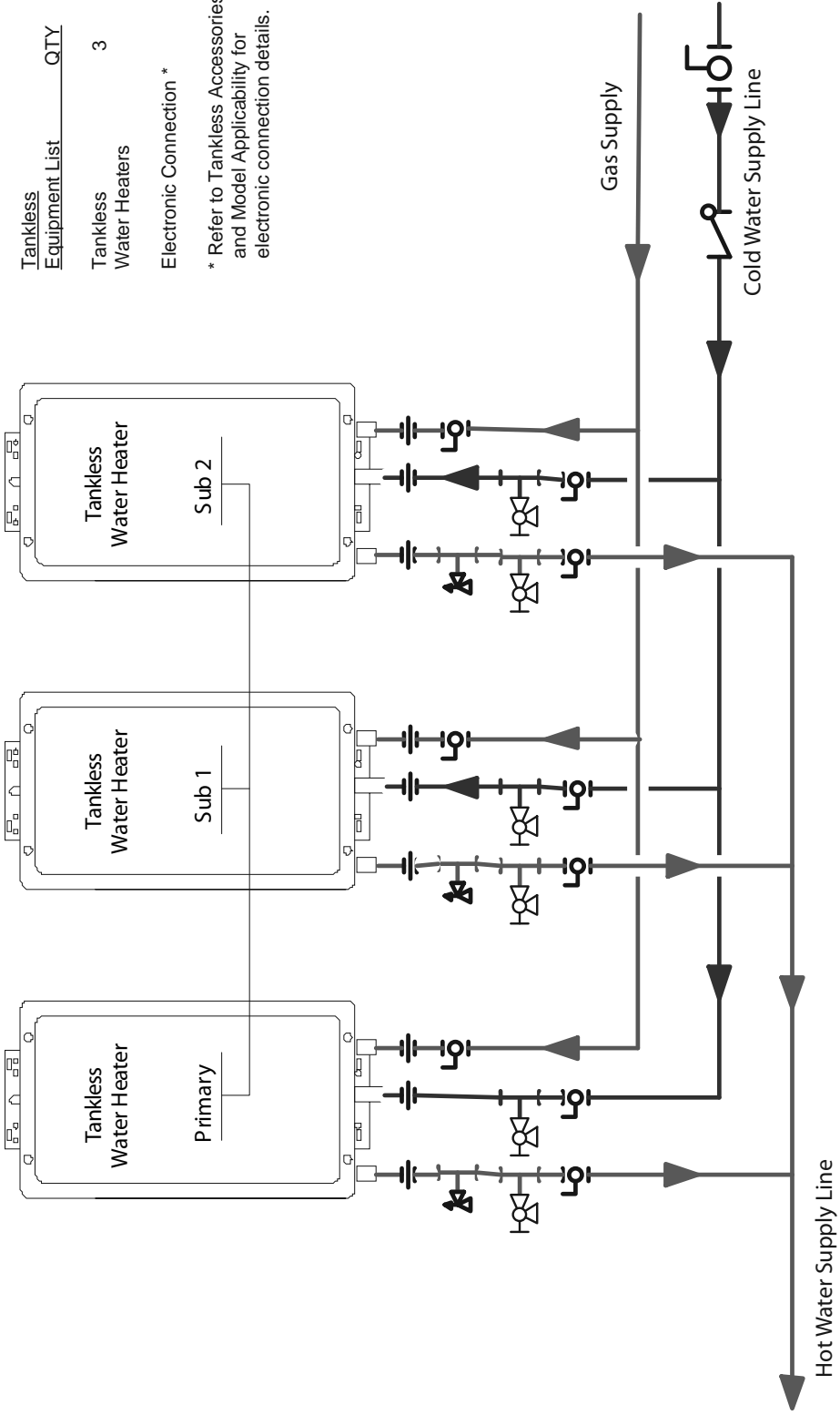
Drawing Date:
February 27, 2008

Key



Tankless Equipment List	QTY
Tankless Water Heaters	3
Electronic Connection *	

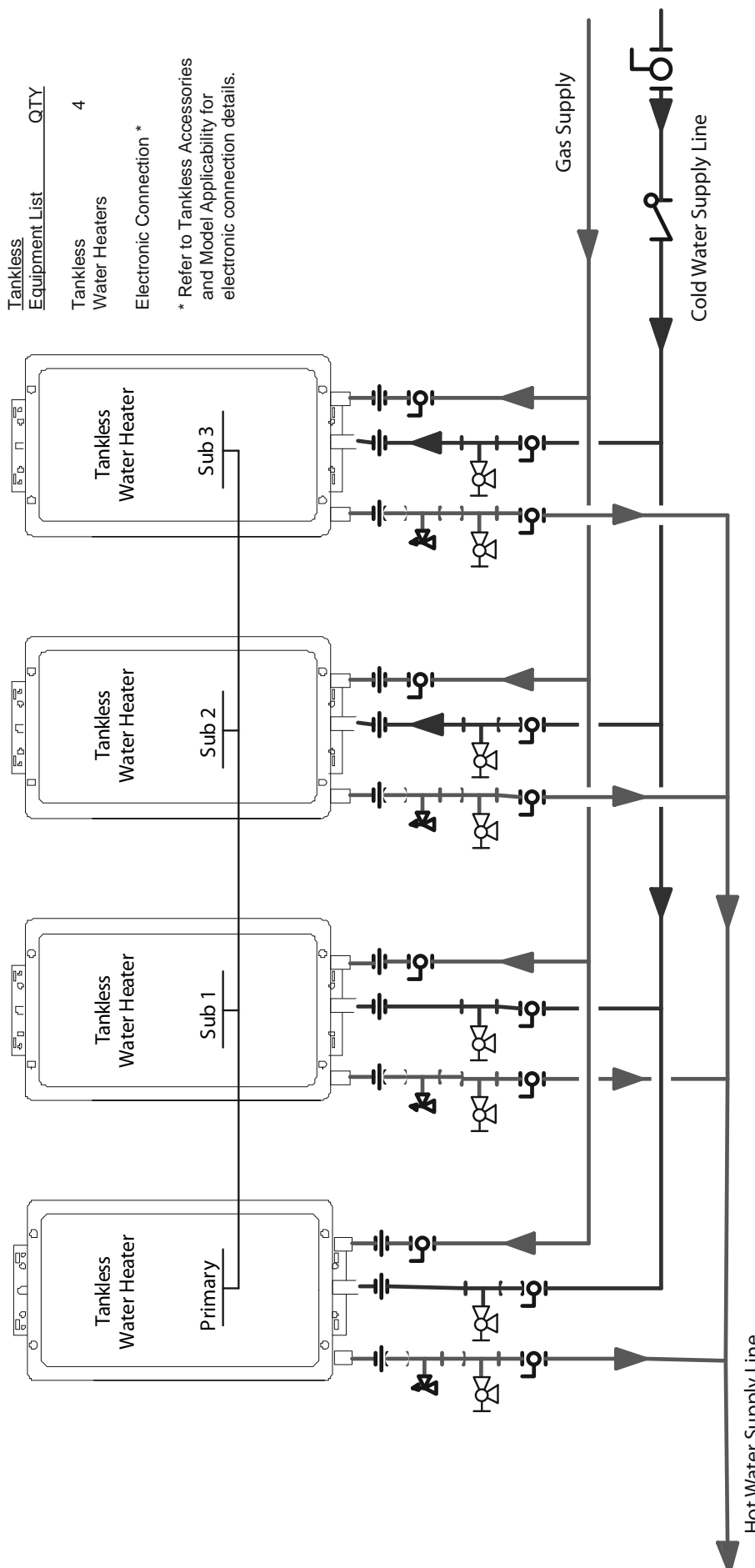
* Refer to Tankless Accessories and Model Applicability for electronic connection details.



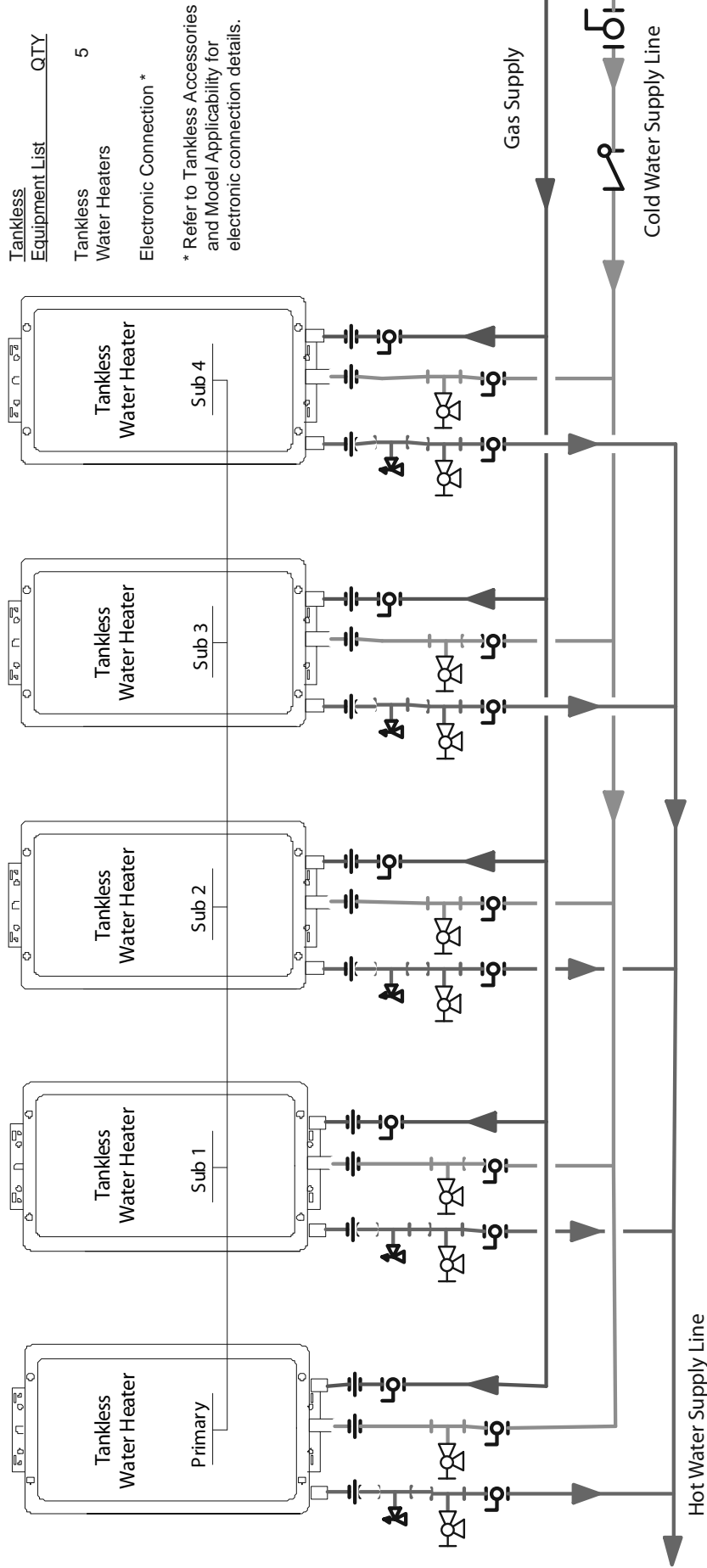
<p>Drawing Number: WH-3</p>	<p>Domestic Hot Water - Standard Installation 3 Tankless Water Heaters Preferred Piping Installation</p>	<p>Drawing Date: February 27, 2008</p>																
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	Pressure Relief Valve		Solenoid Valve															

Tankless Equipment List	QTY
Tankless Water Heaters	4
Electronic Connection *	

* Refer to Tankless Accessories and Model Applicability for electronic connection details.



Drawing Number: WH-4	Domestic Hot Water - Standard Installation 4 Tankless Water Heaters Preferred Piping Installation	
Drawing Date: February 27, 2008	<p>This is not an engineering drawing; it is intended only as a guide and not as a replacement for professional engineering project drawings. This drawing is not intended to describe a complete system. It is up to the contractor or engineer to determine the necessary components and configuration of the particular system to be installed. The drawing does not imply compliance with local building code requirements. It is the responsibility of the engineer or contractor to ensure that the installation is in accordance with all local building codes. Confer with local building officials before installation.</p>	Key

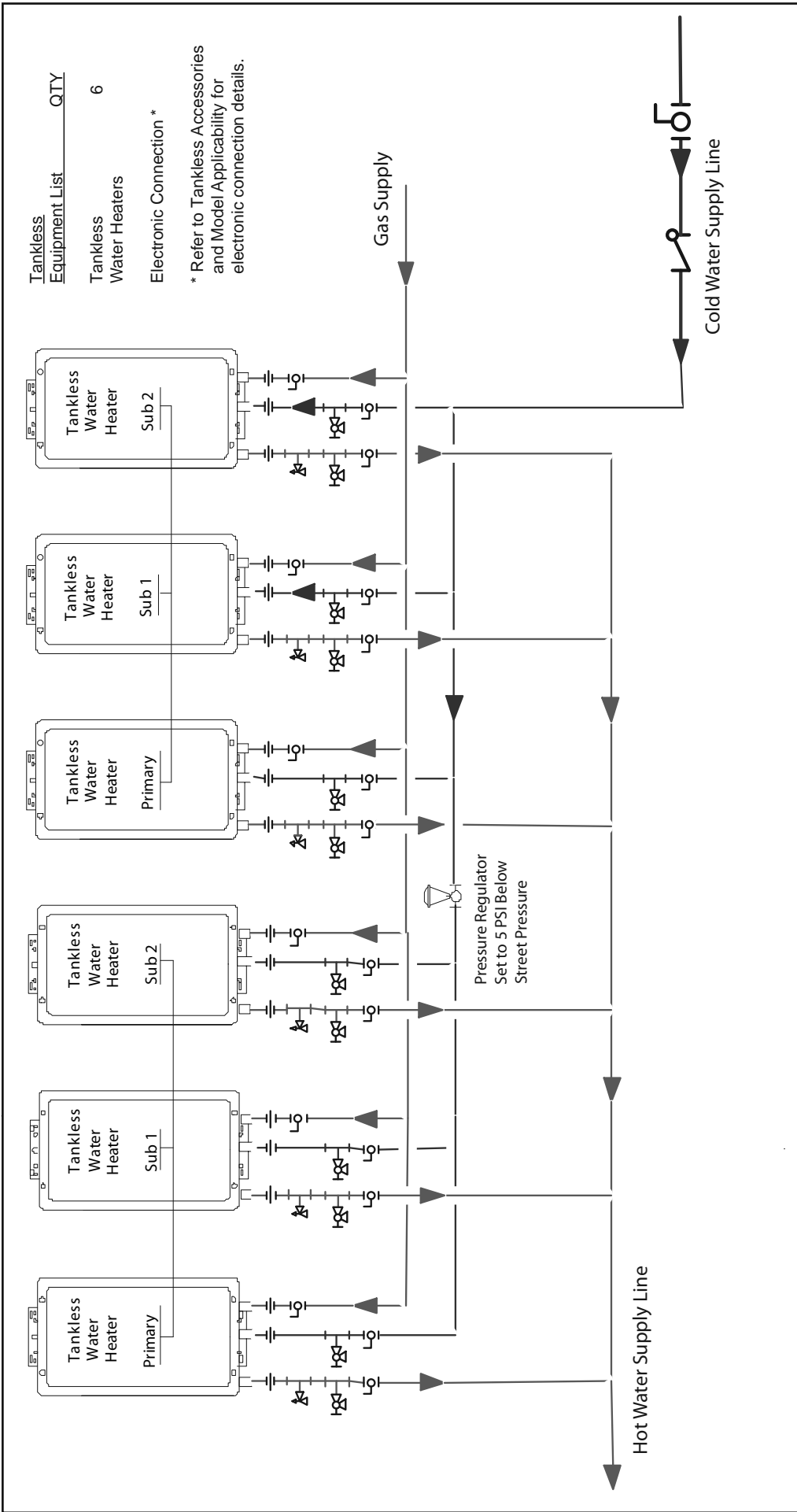


Tankless Equipment List

Equipment List	QTY
Tankless Water Heaters	5
Electronic Connection *	

* Refer to Tankless Accessories and Model Applicability for electronic connection details.

<p>Drawing Number: WH-5</p>	<p>Domestic Hot Water - Standard Installation 5 Tankless Water Heaters Preferred Piping Installation</p>	<p>This is not an engineering drawing; it is intended only as a guide and not as a replacement for professional engineering project drawings. This drawing is not intended to describe a complete system. It is up to the contractor or engineer to determine the necessary components and configuration of the particular system to be installed. The drawing does not imply compliance with local building code requirements. It is the responsibility of the engineer or contractor to ensure that the installation is in accordance with all local building codes. Confer with local building officials before installation.</p>																
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	3/4" Union		Circulating Pump															
	Check Valve		Boiler Drain Valve															
	Pressure Relief Valve		Solenoid Valve															



Equipment List	QTY
Tankless Water Heaters	6
Electronic Connection *	

* Refer to Tankless Accessories and Model Applicability for electronic connection details.

<p>Drawing Number: WH-6</p>	<p>Domestic Hot Water - Standard Installation 6 Tankless Water Heaters Preferred Piping Installation</p>	<p>Key</p>
<p>Drawing Date: February 27, 2008</p>	<p>This is not an engineering drawing; it is intended only as a guide and not as a replacement for professional engineering project drawings. This drawing is not intended to describe a complete system. It is up to the contractor or engineer to determine the necessary components and configuration of the particular system to be installed. The drawing does not imply compliance with local building code requirements. It is the responsibility of the engineer or contractor to ensure that the installation is in accordance with all local building codes. Confer with local building officials before installation.</p>	

IMPORTANT:

With electrical power supplied to a Tankless water heater, it will not freeze in environments as cold as -30°F, when protected from direct wind exposure.

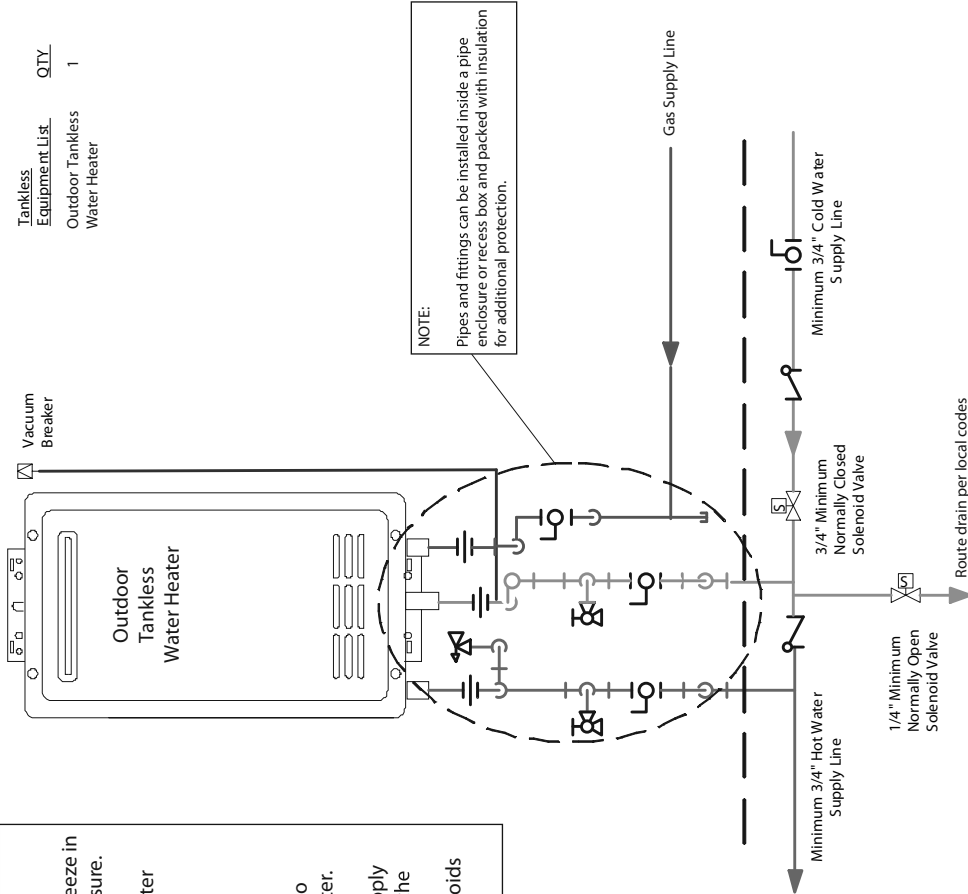
In the event of a power failure at temperatures below freezing, the water heater should be drained of all water to prevent freezing damage.

The unit may be drained manually or through the installation of the Optional solenoid valves as shown.

The electrical connections for the two solenoid valves should be tied to the 120V power terminals provided on the PC Board of the water heater.

When the electrical power to the water heater fails, the cold water supply solenoid valve closes, stopping the flow of water into the heater, and the drain down solenoid valve opens, allowing the water heater and associated piping to drain. Ensure that you run the drain for the solenoids per local codes.

Tankless Equipment List	QTY
Outdoor Tankless Water Heater	1



NOTE:
 Freeze protect all water pipes and fittings located outside building structure. These are indicated by being above the dashed line.
 All pipes and fittings shown below the dashed line should be located inside the building structure.
 The vacuum breaker line should be located inside the building structure.

Domestic Hot Water - Optional Freeze Protection
1 Outdoor Tankless Water Heater
Preferred Piping Installation

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Drawing Number:
WH-1-D

Drawing Date:
June 11, 2007

Key

	3/4" Ball Valve
	3/4" Union
	Check Valve
	Pressure Relief Valve
	Pressure Regulator
	Circulating Pump
	Boiler Drain Valve
	Solenoid Valve

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Tankless Equipment List QTY

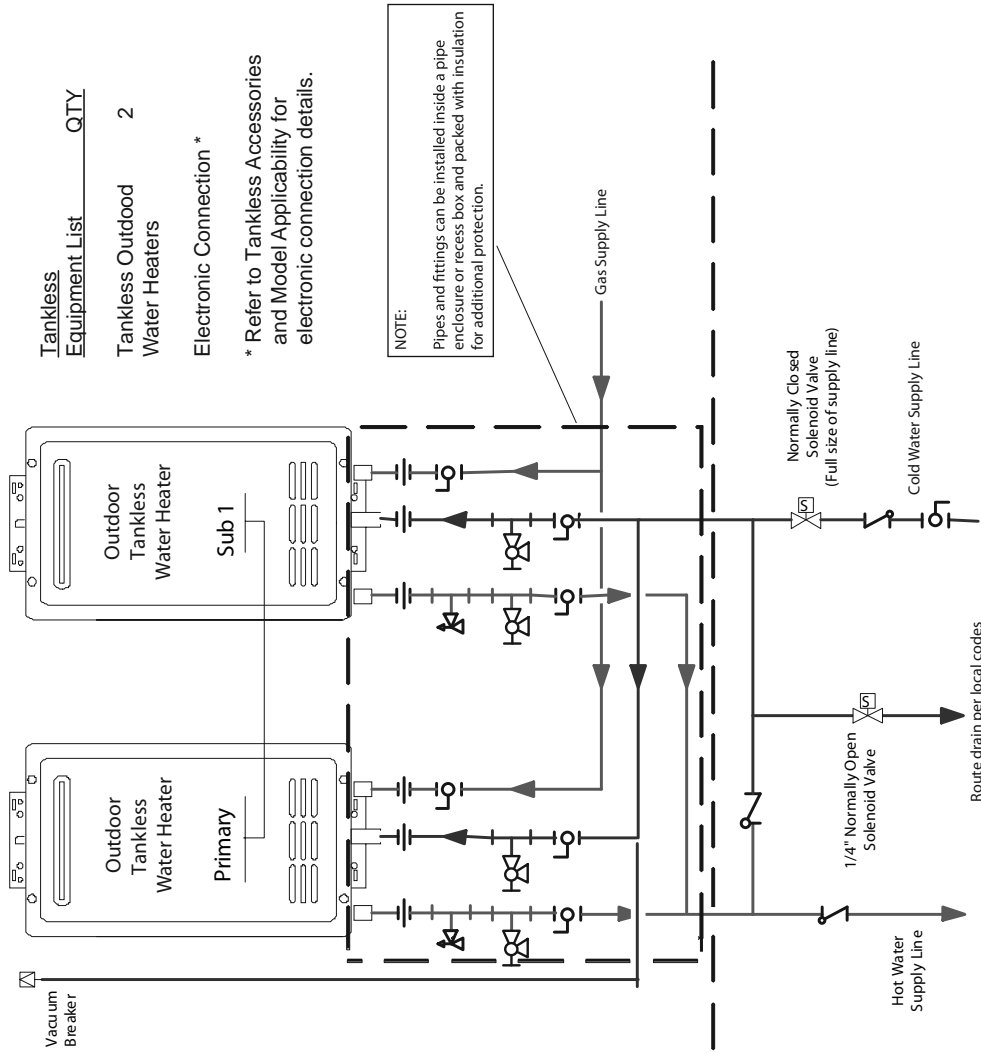
Tankless Outdoor Water Heaters 2

Electronic Connection *

* Refer to Tankless Accessories and Model Applicability for electronic connection details.

NOTE:

Pipes and fittings can be installed inside a pipe enclosure or recess box and packed with insulation for additional protection.



**Domestic Hot Water - Optional Freeze Protection
2 Outdoor Tankless Water Heaters
Preferred Piping Installation**

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Drawing Number:

WH-2-D

Drawing Date:

February 27, 2008

Key

- 3/4" Ball Valve
- 3/4" Union
- Check Valve
- Pressure Relief Valve
- Pressure Regulator
- Circulating Pump
- Boiler Drain Valve
- Solenoid Valve

IMPORTANT:

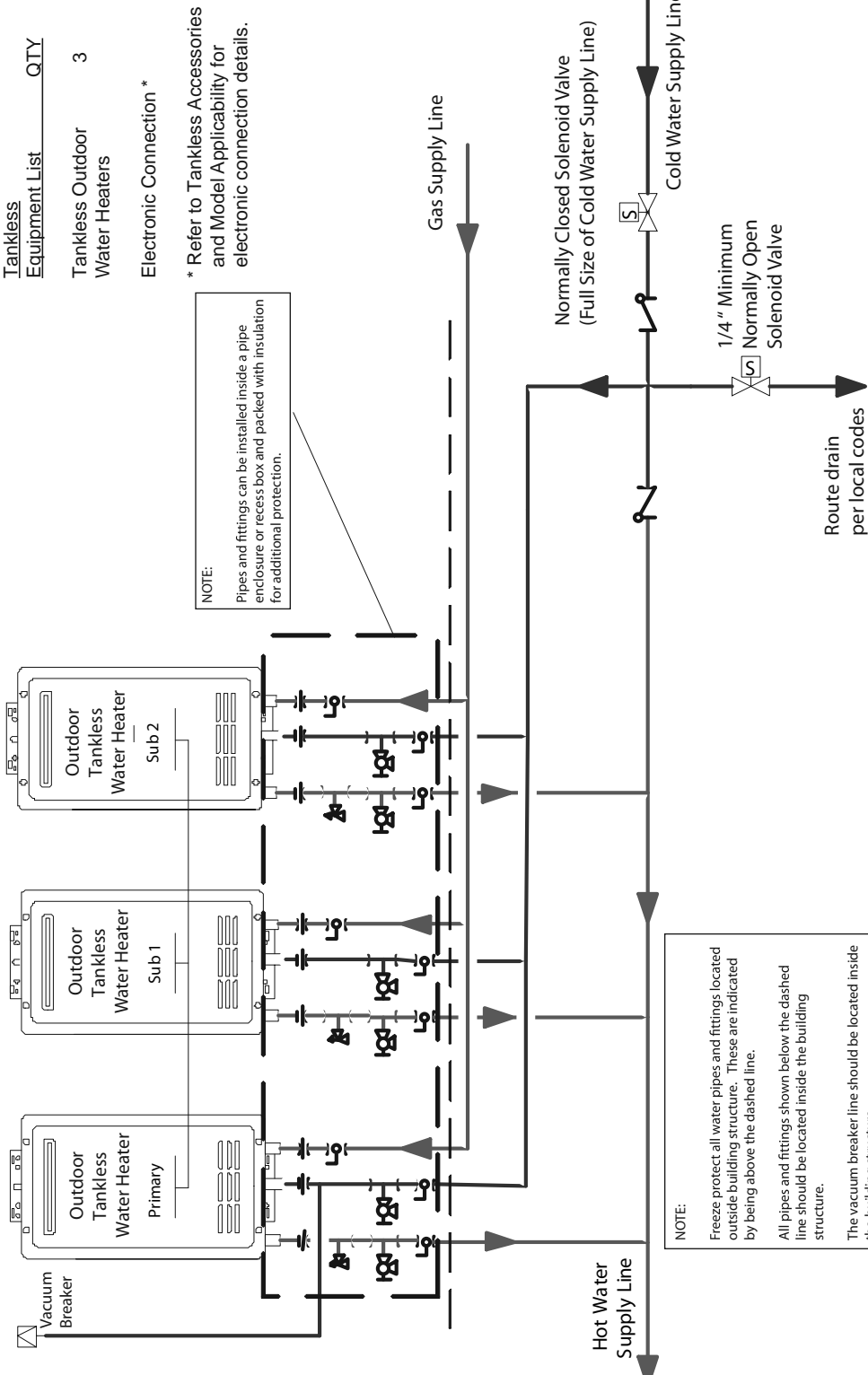
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In the event of a power failure at temperatures below freezing, the water heater should be drained of all water to prevent freezing damage.

The unit may be drained manually or through the installation of the Optional solenoid valves as shown.

The electrical connections for the two solenoid valves should be tied to the 120 V power terminals provided on the PC Board of the water heater.

When the electrical power to the water heater fails, the cold water supply solenoid valve closes, stopping the flow of water into the heater, and the drain down solenoid valve opens, allowing the water heater and associated piping to drain. Ensure that you run the drain for the solenoids per local codes.



Tankless Equipment List	QTY
Tankless Outdoor Water Heaters	3
Electronic Connection *	

* Refer to Tankless Accessories and Model Applicability for electronic connection details.

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NOTE:
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Domestic Hot Water - Optional Freeze Protection
3 Outdoor Tankless Water Heaters
Preferred Piping Installation

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Drawing Number: WH-3-D

Drawing Date: February 27, 2008

Key

	3/4" Ball Valve
	3/4" Union
	Check Valve
	Pressure Relief Valve
	Pressure Regulator
	Circulating Pump
	Boiler Drain Valve
	Solenoid Valve

IMPORTANT!

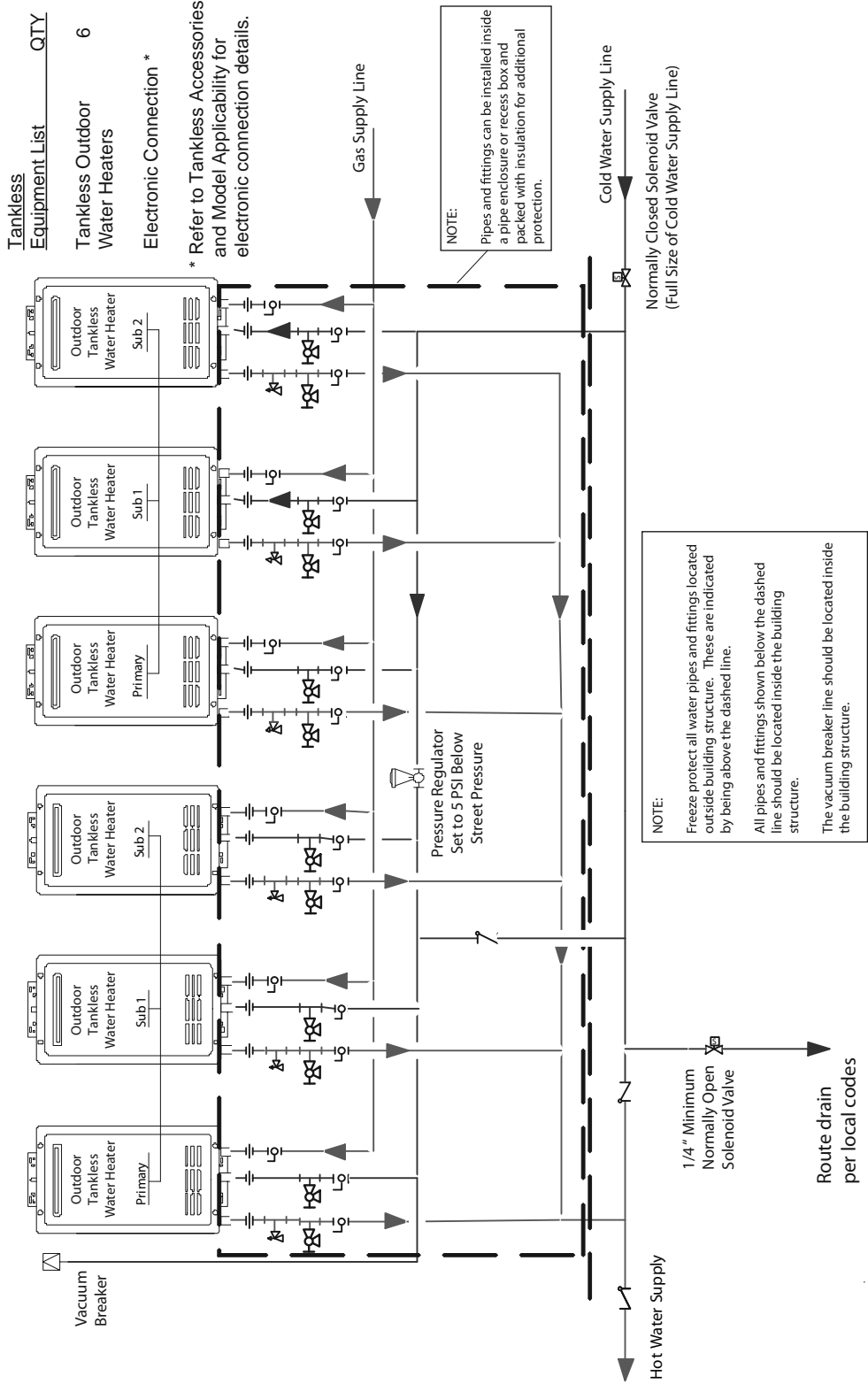
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Key	
	3/4" Ball Valve
	3/4" Union
	Check Valve
	Pressure Relief Valve
	Pressure Regulator
	Circulating Pump
	Boiler Drain Valve
	Solenoid Valve

Domestic Hot Water - Optional Freeze Protection
6 Outdoor Tankless Water Heaters
Preferred Piping Installation

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Drawing Number:
WH-6-D

Drawing Date:
February 27, 2008

For this application:

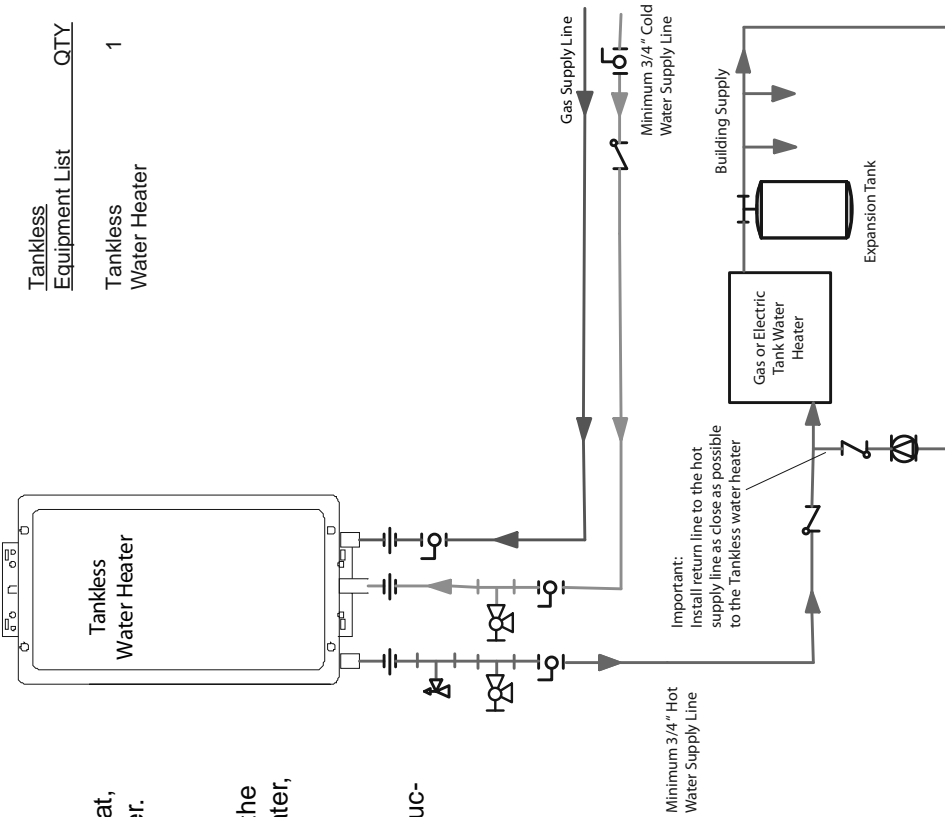
Pump should be controlled by an Aquastat, Timer or Combination Aquastat and Timer.
 Pump to be sized to maintain circulation loop temperature.
 The pump should be sized to overcome the pressure loss through the tank water heater, and supply and return plumbing in the circulation loop. Reference the section *Pump Sizing for Circulation*.
 Pump to be of bronze or stainless construction.

Tankless
 Equipment List

Tankless
 Water Heater

QTY

1



Drawing Number:

WH-1-RGE








Drawing Date:

February 27, 2008

**Domestic Hot Water - Circulation Systems
 1 Tankless Water Heater with Gas or Electric Tank
 Preferred Piping Installation**

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Key

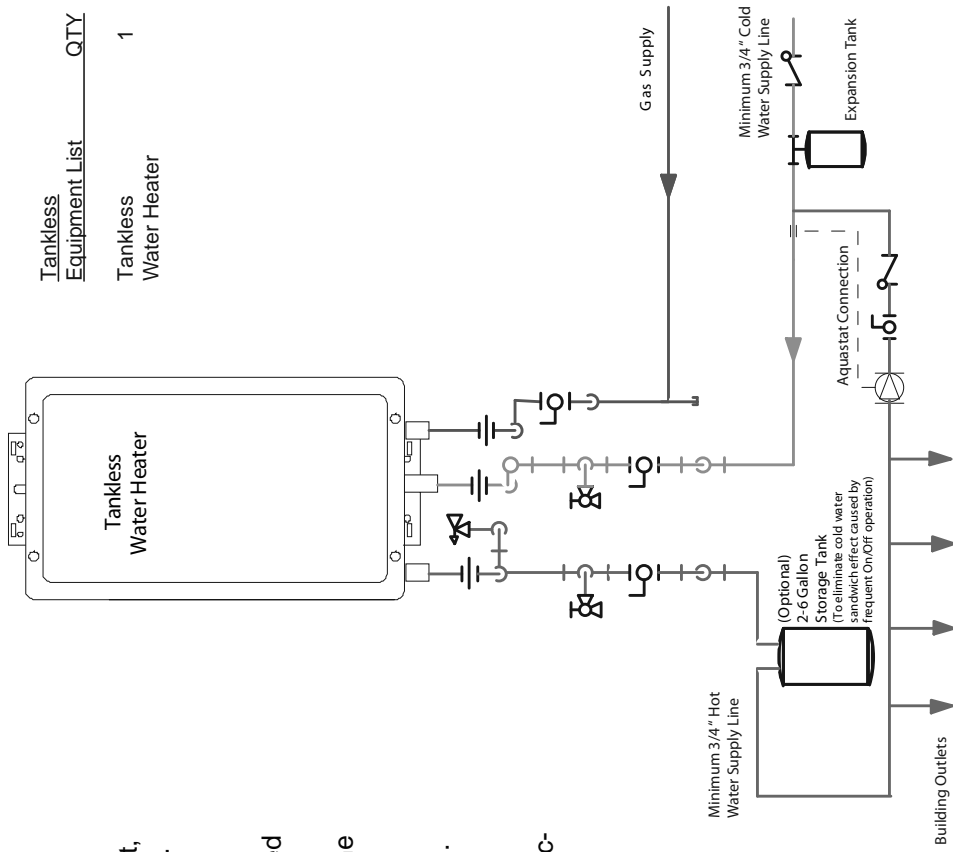
-  3/4" Ball Valve
-  3/4" Union
-  Check Valve
-  Pressure Relief Valve
-  Pressure Regulator
-  Circulating Pump
-  Boiler Drain Valve
-  Solenoid Valve

For this application:

Pump should be controlled by an Aquastat, Timer or Combination Aquastat and Timer.
 Pump to be sized to maintain circulation loop temperature.
 A minimum of 3 GPM flow is recommended for the circulation system.
 The pump should be sized to overcome the pressure loss through the Tankless water heater, optional storage tank, and supply and return plumbing in the circulation loop. Reference the section *Pump Sizing for Circulation*.
 Pump to be of bronze or stainless construction.

Tankless
 Equipment List QTY

Tankless
 Water Heater 1



Domestic Hot Water - Circulation Systems
 1 Tankless Water Heater
 Optional Piping Installation

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Drawing Number:
 WH-1-R

Drawing Date:
 June 11, 2007

Key

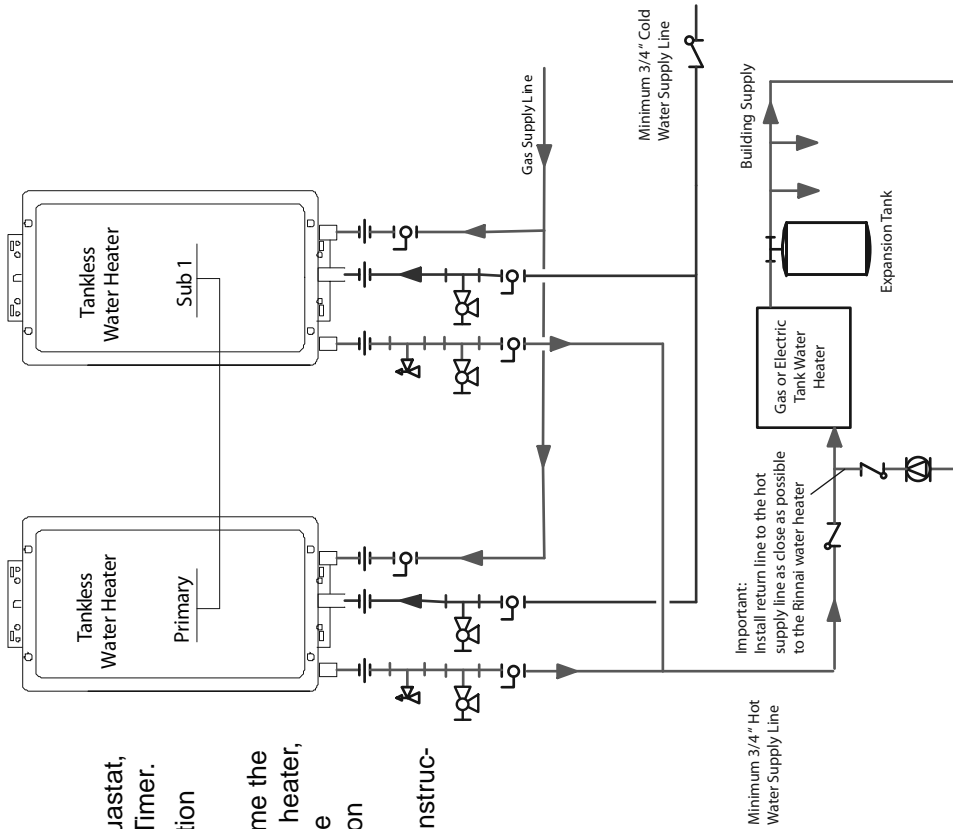
- 3/4" Ball Valve
- 3/4" Union
- Check Valve
- Pressure Relief Valve
- Pressure Regulator
- Circulating Pump
- Boiler Drain Valve
- Solenoid Valve

For this application:

- Pump should be controlled by an Aquastat, Timer or Combination Aquastat and Timer.
- Pump to be sized to maintain circulation loop temperature.
- The pump should be sized to overcome the pressure loss through the tank water heater, and supply and return plumbing in the circulation loop. Reference the section *Pump Sizing for Circulation*.
- Pump to be of bronze or stainless construction.

Tankless Water Heaters	2
Electronic Connection *	

* Refer to Tankless Accessories and Model Applicability for electronic connection details.



Drawing Number:
WH-2-RGE

Drawing Date:
February 27, 2008

**Domestic Hot Water - Circulation Systems
2 Tankless Water Heaters with Gas or Electric Tank
Preferred Piping Installation**

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Key

	3/4" Ball Valve		Pressure Regulator
	3/4" Union		Circulating Pump
	Check Valve		Boiler Drain Valve
	Pressure Relief Valve		Solenoid Valve

For this application:

Pump should be controlled by an Aquastat, Timer or Combination Aquastat and Timer.

Pump to be sized to maintain circulation loop temperature.

A minimum of 3 GPM flow is recommended for the circulation system.

The pump should be sized to overcome the pressure loss through the Tankless water heater, optional storage tank, and supply and return plumbing in the circulation loop. Reference the section *Pump Sizing for Circulation*.

Pump to be of bronze or stainless construction.

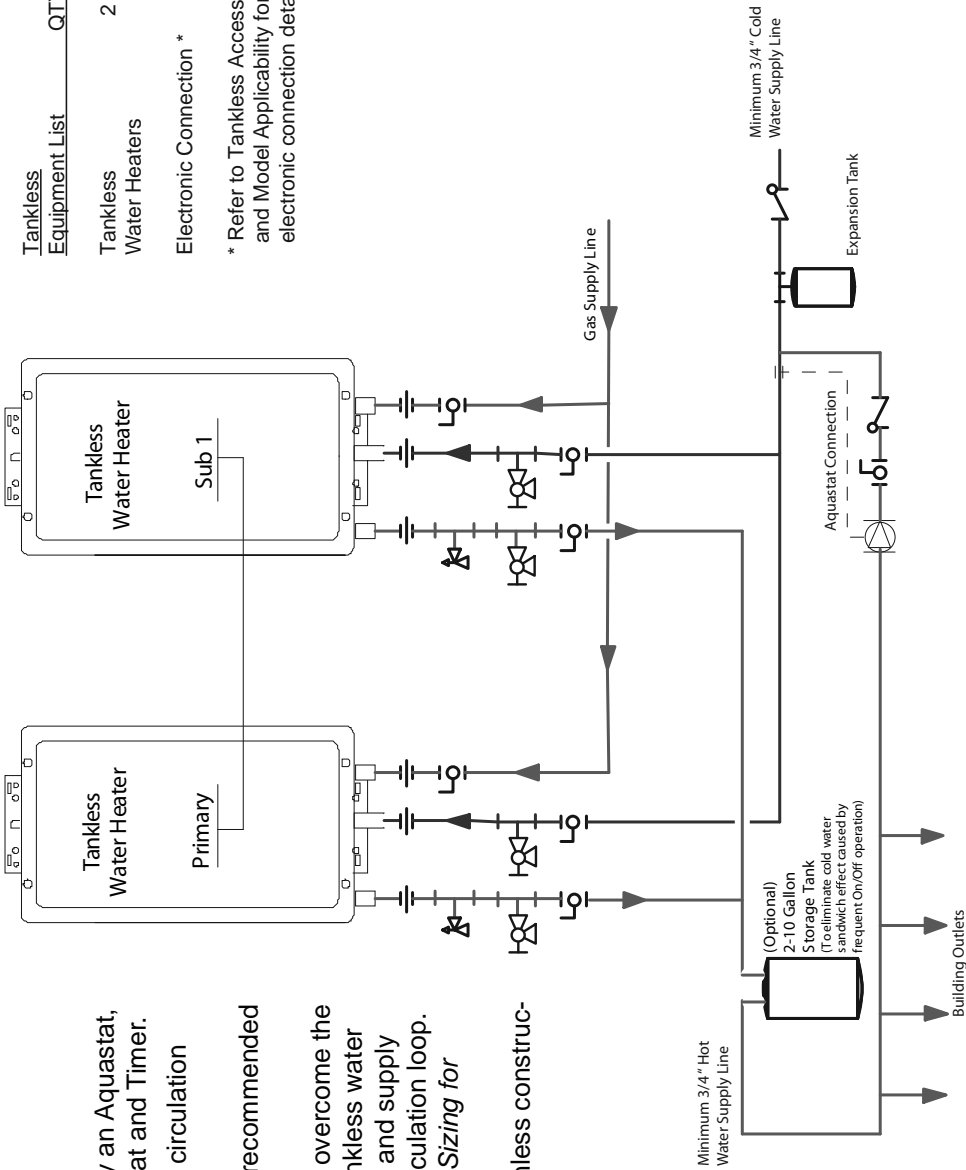
Tankless
Equipment List

QTY

Tankless
Water Heaters 2

Electronic Connection *

* Refer to Tankless Accessories and Model Applicability for electronic connection details.



**Domestic Hot Water - Circulation Systems
2 Tankless Water Heaters
Optional Piping Installation**

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Drawing Number:
WH-2-R

Drawing Date:
February 27, 2008

Key

- 3/4" Ball Valve
- 3/4" Union
- Check Valve
- Pressure Relief Valve
- Pressure Regulator
- Circulating Pump
- Boiler Drain Valve
- Solenoid Valve

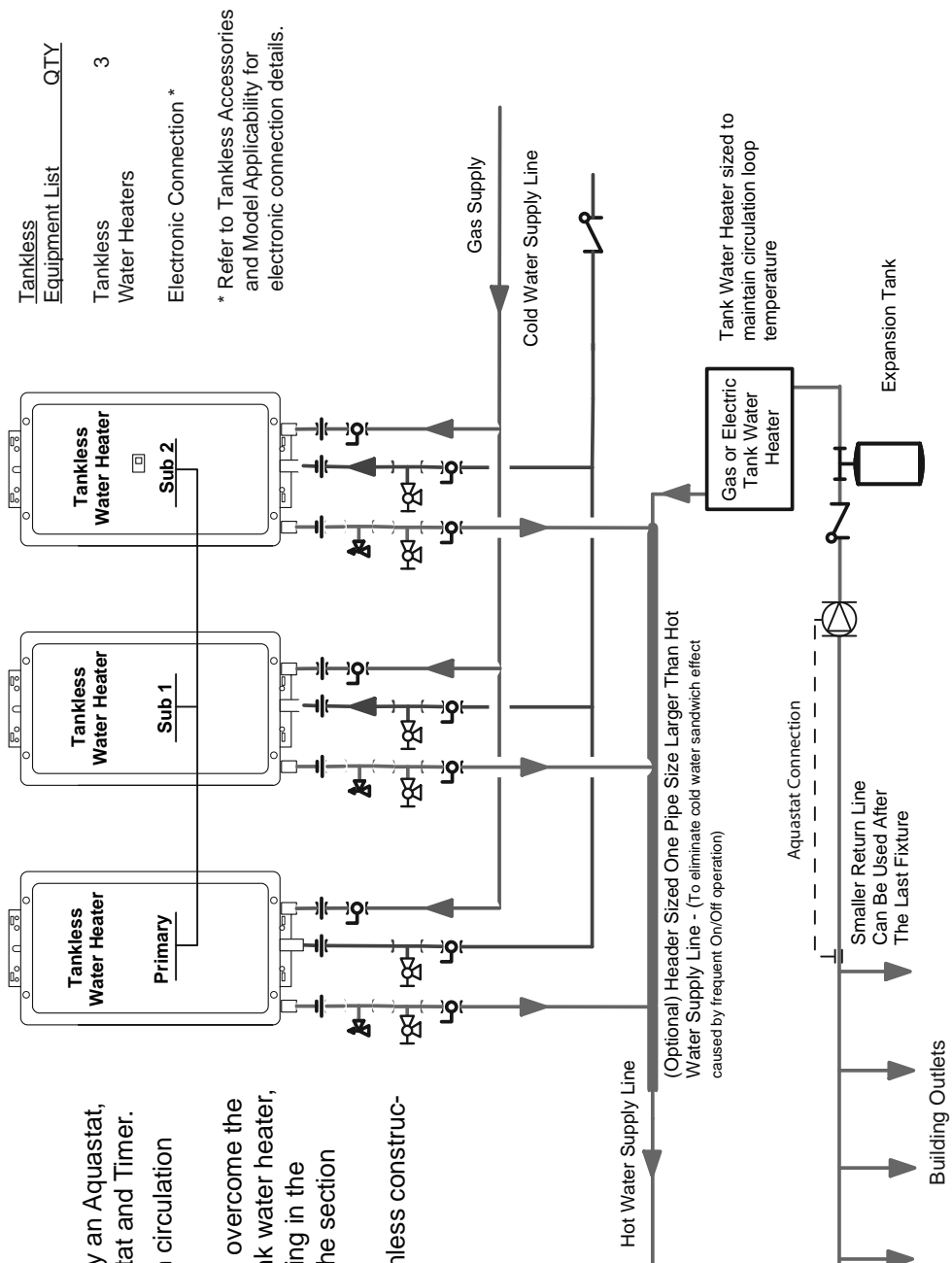
For this application:

Pump should be controlled by an Aquastat, Timer or Combination Aquastat and Timer.

Pump to be sized to maintain circulation loop temperature.

The pump should be sized to overcome the pressure loss through the tank water heater, and supply and return plumbing in the circulation loop. Reference the section *Pump Sizing for Circulation*.

Pump to be of bronze or stainless construction.



Tankless Equipment List	QTY
Tankless Water Heaters	3
Electronic Connection *	

* Refer to Tankless Accessories and Model Applicability for electronic connection details.

<p>Drawing Number: WH-3-RGE</p>	<p>Domestic Hot Water - Circulation Systems 3 Tankless Water Heaters with Gas or Electric Tank Preferred Piping Installation</p>	<p>Key</p>																
<p>Drawing Date: February 27, 2008</p>	<p>This is not an engineering drawing; it is intended only as a guide and not as a replacement for professional engineering project drawings. This drawing is not intended to describe a complete system. It is up to the contractor or engineer to determine the necessary components and configuration of the particular system to be installed. The drawing does not imply compliance with local building code requirements. It is the responsibility of the engineer or contractor to ensure that the installation is in accordance with all local building codes. Confer with local building officials before installation.</p>	<table border="1"> <tr> <td></td> <td>3/4" Ball Valve</td> </tr> <tr> <td></td> <td>3/4" Union</td> </tr> <tr> <td></td> <td>Check Valve</td> </tr> <tr> <td></td> <td>Pressure Relief Valve</td> </tr> <tr> <td></td> <td>Pressure Regulator</td> </tr> <tr> <td></td> <td>Circulating Pump</td> </tr> <tr> <td></td> <td>Boiler Drain Valve</td> </tr> <tr> <td></td> <td>Solenoid Valve</td> </tr> </table>		3/4" Ball Valve		3/4" Union		Check Valve		Pressure Relief Valve		Pressure Regulator		Circulating Pump		Boiler Drain Valve		Solenoid Valve
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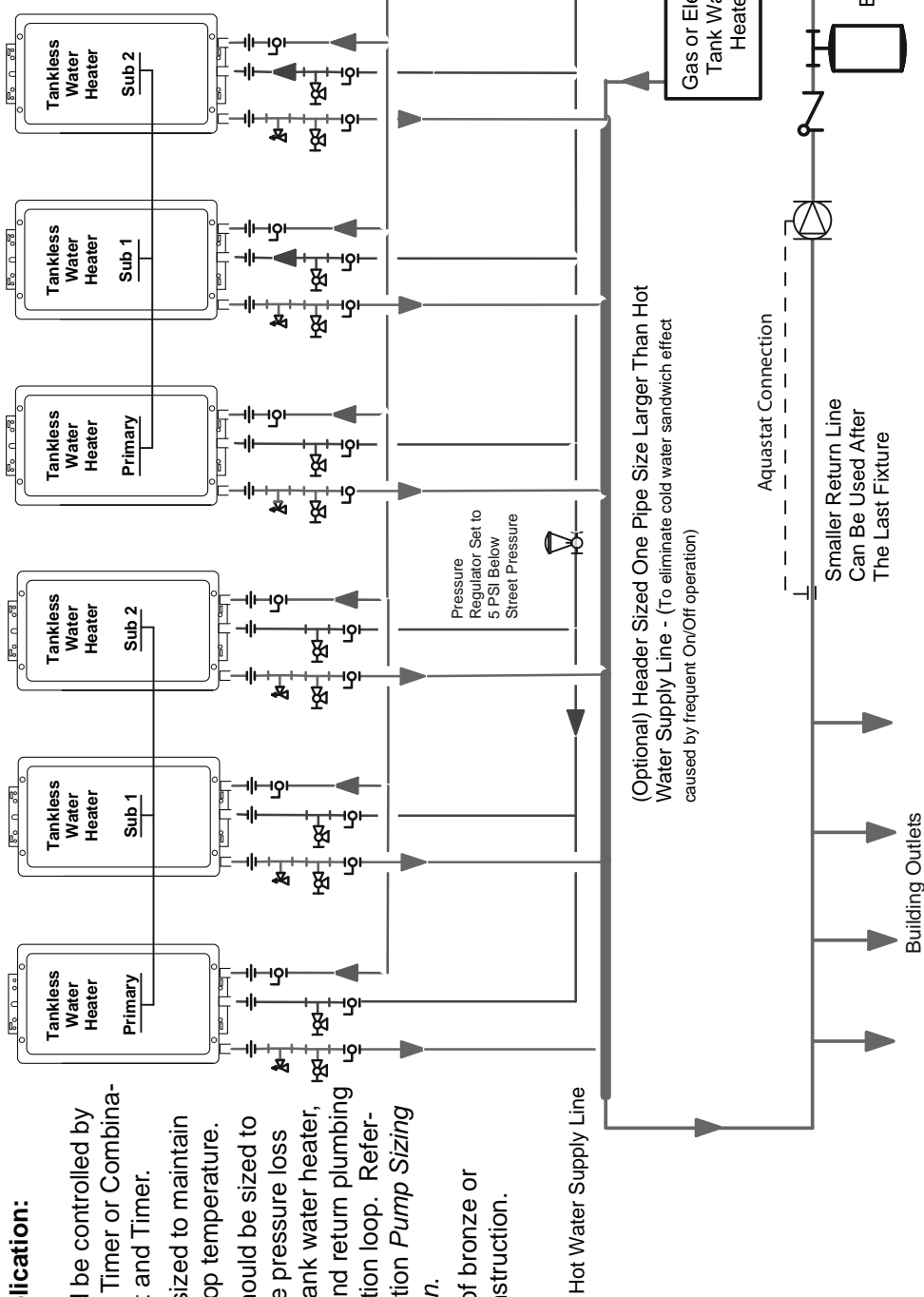
For this application:

Pump should be controlled by an Aquastat, Timer or Combination Aquastat and Timer. Pump to be sized to maintain circulation loop temperature. The pump should be sized to overcome the pressure loss through the tank water heater, and supply and return plumbing in the circulation loop. Reference the section *Pump Sizing for Circulation*. Pump to be of bronze or stainless construction.

Tankless Equipment List

Equipment	QTY
Tankless Water Heaters	6
Electronic Connection *	

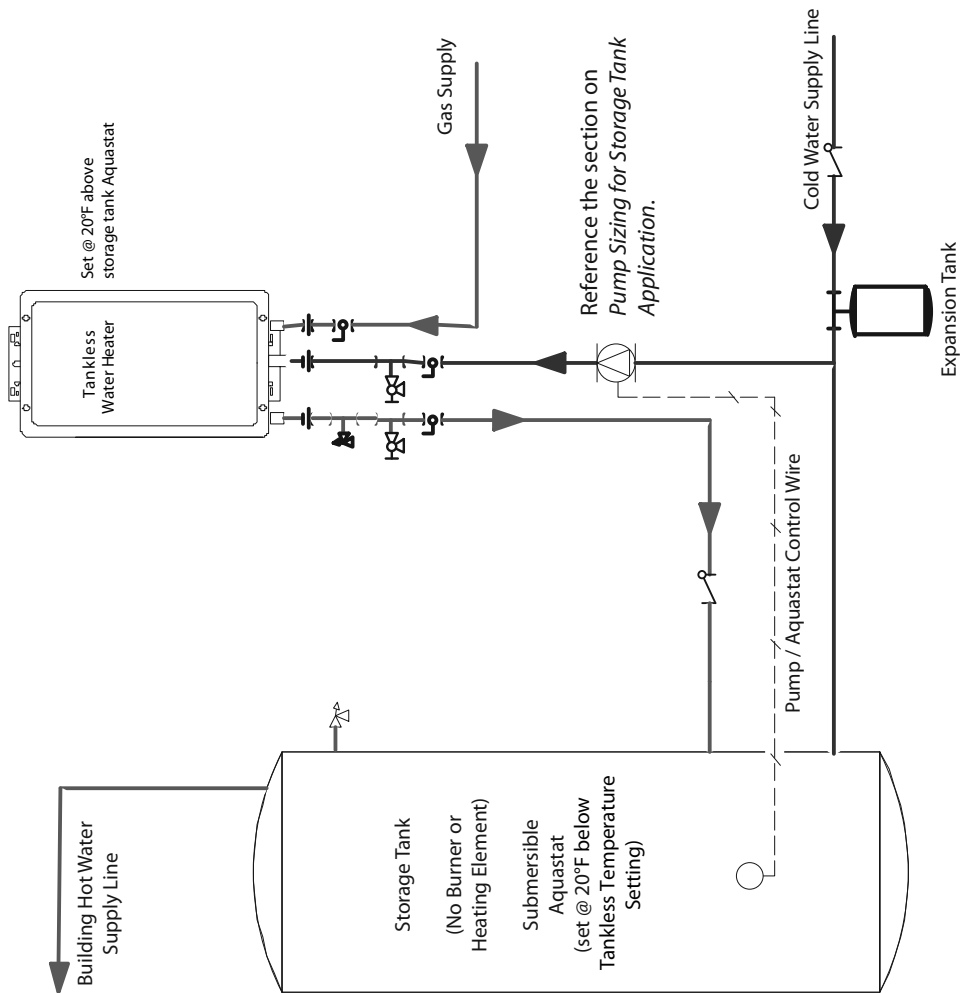
* Refer to Tankless Accessories and Model Applicability for electronic connection details.



<p>Drawing Number: WH-6-RGE</p>	<p>Domestic Hot Water - Circulation Systems 6 Tankless Water Heaters with Gas or Electric Tank Preferred Piping Installation</p>		<p>Key</p>
<p>Drawing Date: February 27, 2008</p>	<p>This is not an engineering drawing; it is intended only as a guide and not as a replacement for professional engineering project drawings. This drawing is not intended to describe a complete system. It is up to the contractor or engineer to determine the necessary components and configuration of the particular system to be installed. The drawing does not imply compliance with local building code requirements. It is the responsibility of the engineer or contractor to ensure that the installation is in accordance with all local building codes. Confer with local building officials before installation.</p>		

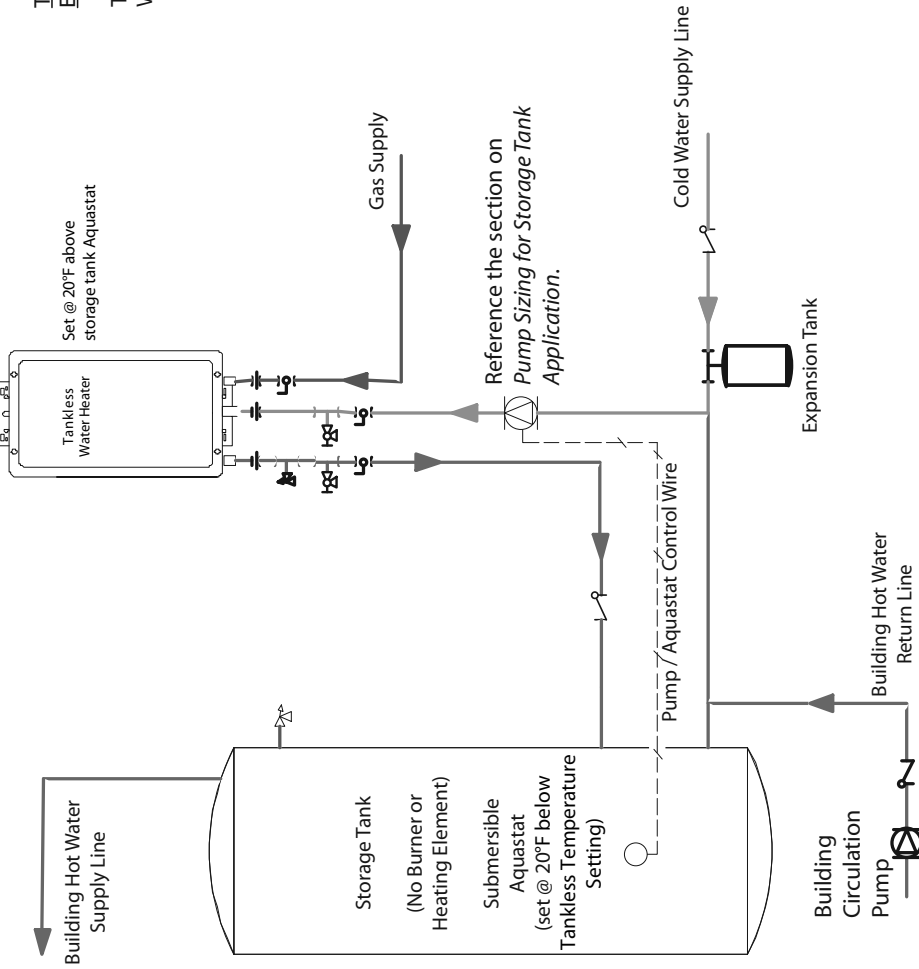
Tankless
Equipment List

Equipment List	QTY
Tankless Commercial Water Heater	1



<p>Drawing Number: WH-1-B</p>	<p>Domestic Hot Water - Backup Storage 1 Tankless Water Heater Preferred Piping Installation</p>	<p>This is not an engineering drawing; it is intended only as a guide and not as a replacement for professional engineering project drawings. This drawing is not intended to describe a complete system. It is up to the contractor or engineer to determine the necessary components and configuration of the particular system to be installed. The drawing does not imply compliance with local building code requirements. It is the responsibility of the engineer or contractor to ensure that the installation is in accordance with all local building codes. Confer with local building officials before installation.</p>
<p>Drawing Date: February 27, 2008</p>	<p>Key</p>	<p>Pressure Regulator Circulating Pump Boiler Drain Valve Solenoid Valve</p>
<p>3/4" Ball Valve 3/4" Union Check Valve Pressure Relief Valve</p>		<p>Pressure Regulator Circulating Pump Boiler Drain Valve Solenoid Valve</p>

Tankless
Equipment List _____ QTY
Tankless Commercial 1
Water Heater











**Domestic Hot Water - Backup Storage / Circulation
1 Tankless Water Heater
Preferred Piping Installation**

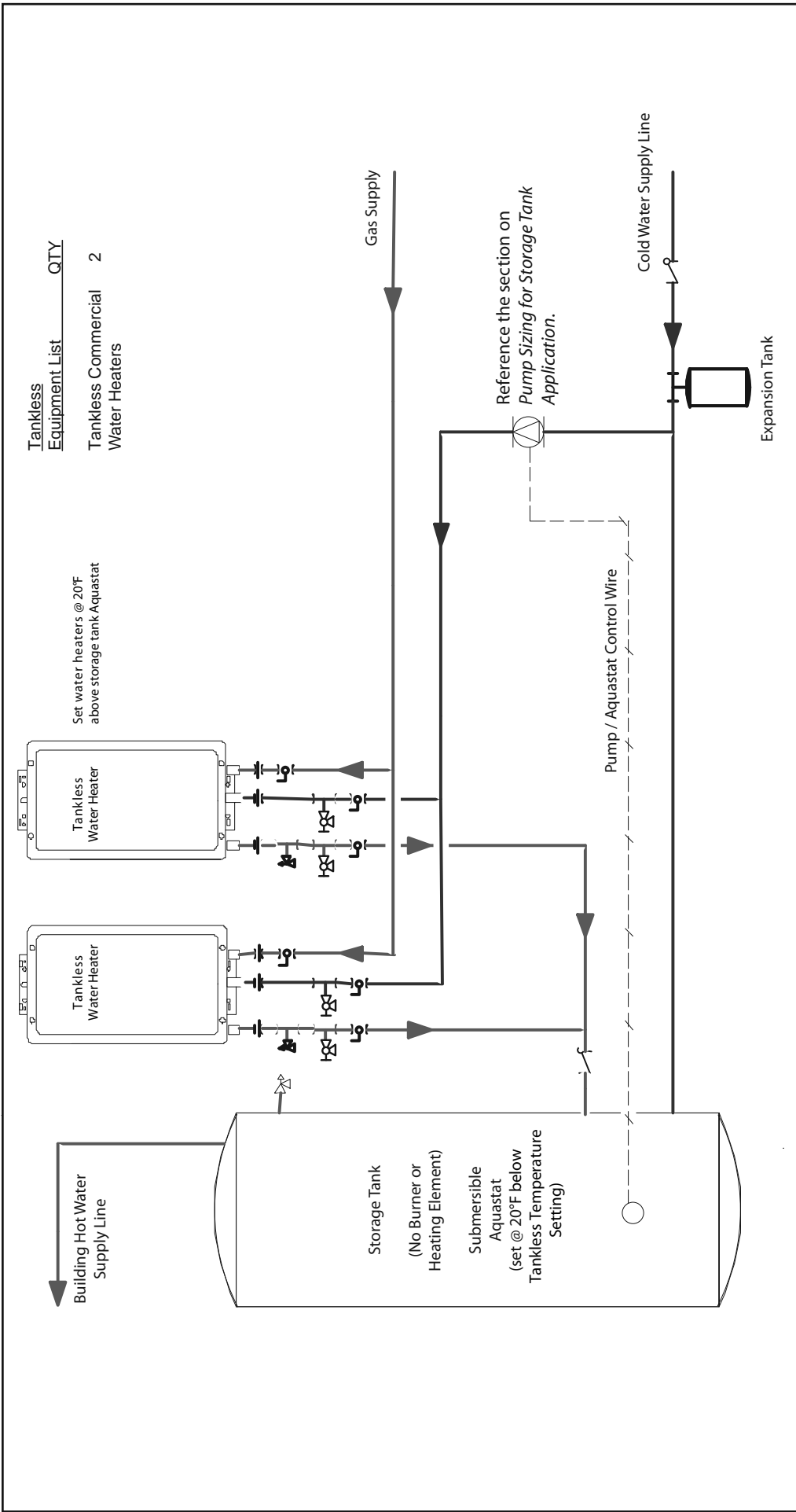
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Drawing Number:
WH-1-B-R

Drawing Date:
February 27, 2008

Key

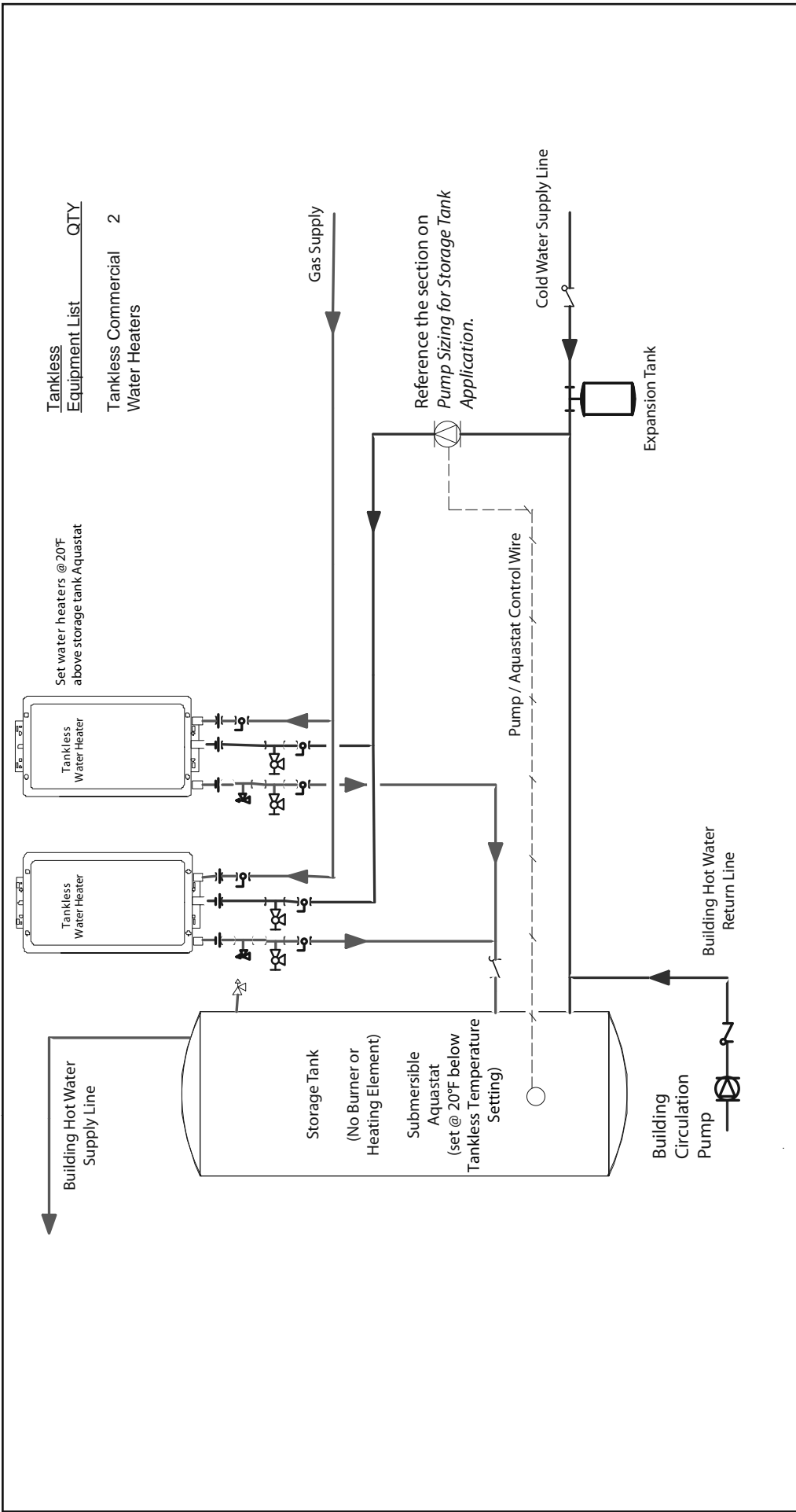
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-  Check Valve
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-  Pressure Regulator
-  Circulating Pump
-  Boiler Drain Valve
-  Solenoid Valve



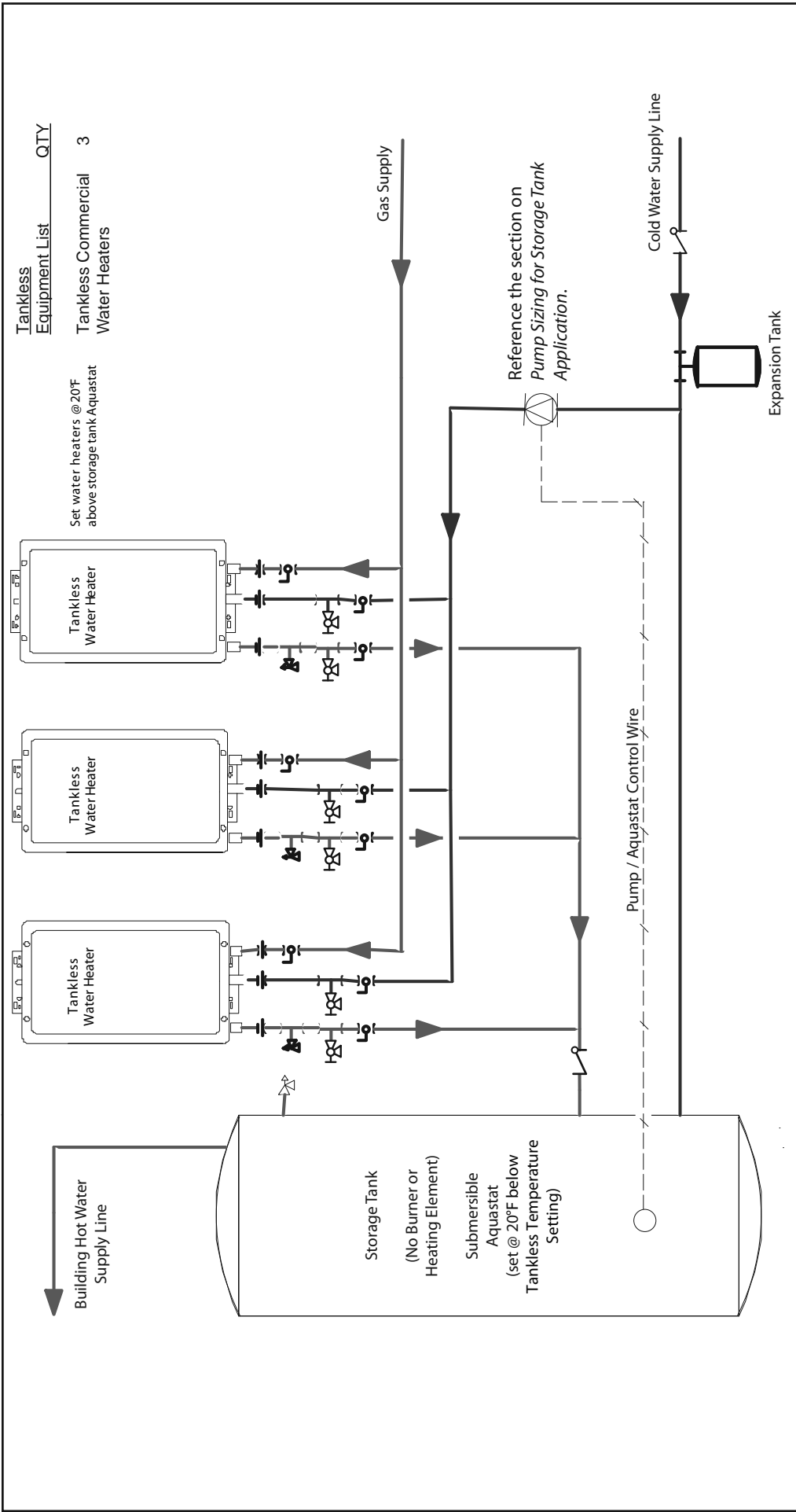
Tankless Equipment List	QTY
Tankless Commercial Water Heaters	2

Set water heaters @ 20°F above storage tank Aquastat

<p>Drawing Number: WH-2-B</p>	<p>Domestic Hot Water - Backup Storage 2 Tankless Water Heaters Preferred Piping Installation</p> <p>This is not an engineering drawing; it is intended only as a guide and not as a replacement for professional engineering project drawings. This drawing is not intended to describe a complete system. It is up to the contractor or engineer to determine the necessary components and configuration of the particular system to be installed. The drawing does not imply compliance with local building code requirements. It is the responsibility of the engineer or contractor to ensure that the installation is in accordance with all local building codes. Confer with local building officials before installation.</p>																	
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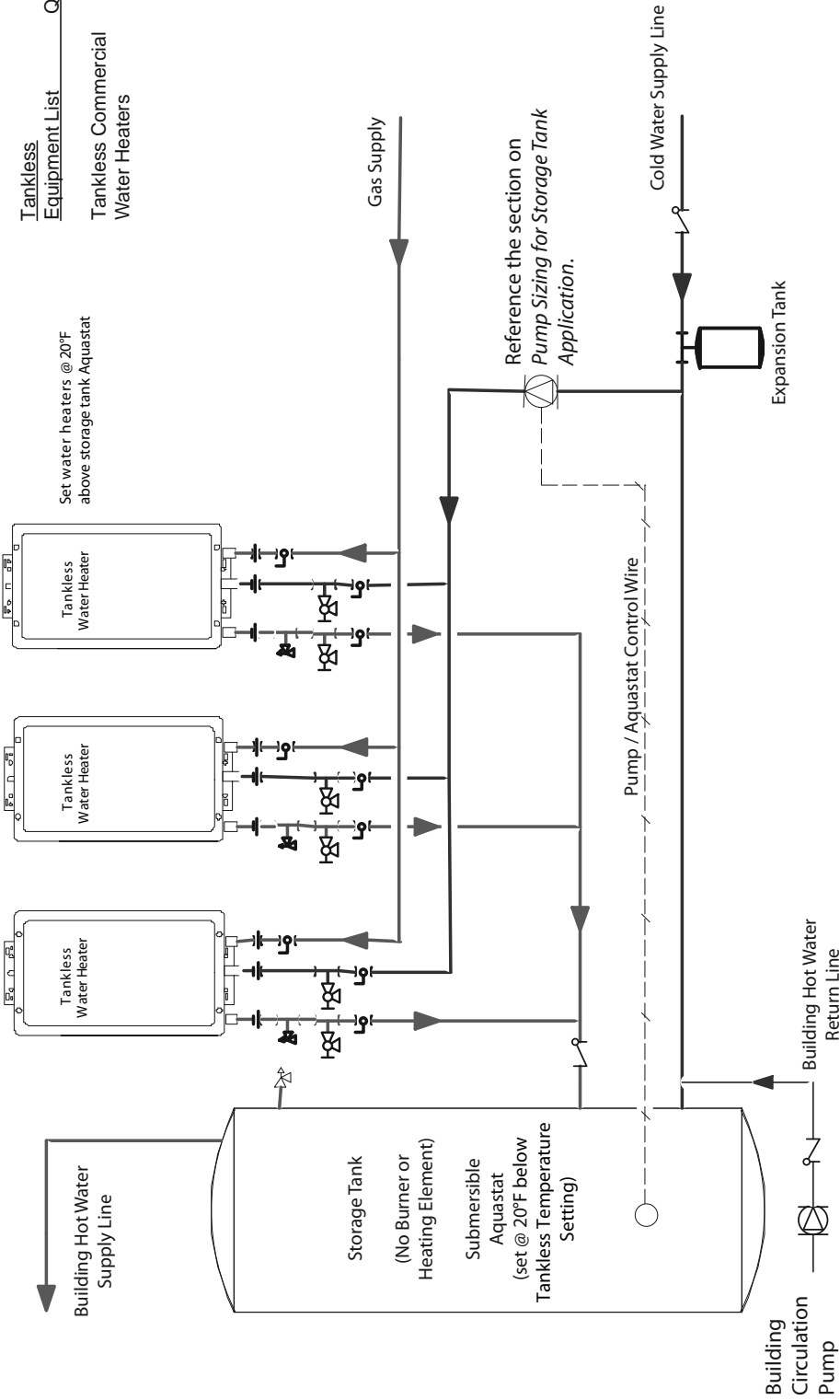
Drawing Number: WH-2-B-R	Domestic Hot Water - Backup Storage / Circulation 2 Tankless Water Heaters Preferred Piping Installation	Key																
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<p>Drawing Number: WH-3-B</p>	<p>Domestic Hot Water - Backup Storage 3 Tankless Water Heaters Preferred Piping Installation</p> <p>This is not an engineering drawing; it is intended only as a guide and not as a replacement for professional engineering project drawings. This drawing is not intended to describe a complete system. It is up to the contractor or engineer to determine the necessary components and configuration of the particular system to be installed. The drawing does not imply compliance with local building code requirements. It is the responsibility of the engineer or contractor to ensure that the installation is in accordance with all local building codes. Confer with local building officials before installation.</p>																
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Tankless Equipment List	QTY
Tankless Commercial Water Heaters	3

Set water heaters @ 20°F above storage tank Aquastat



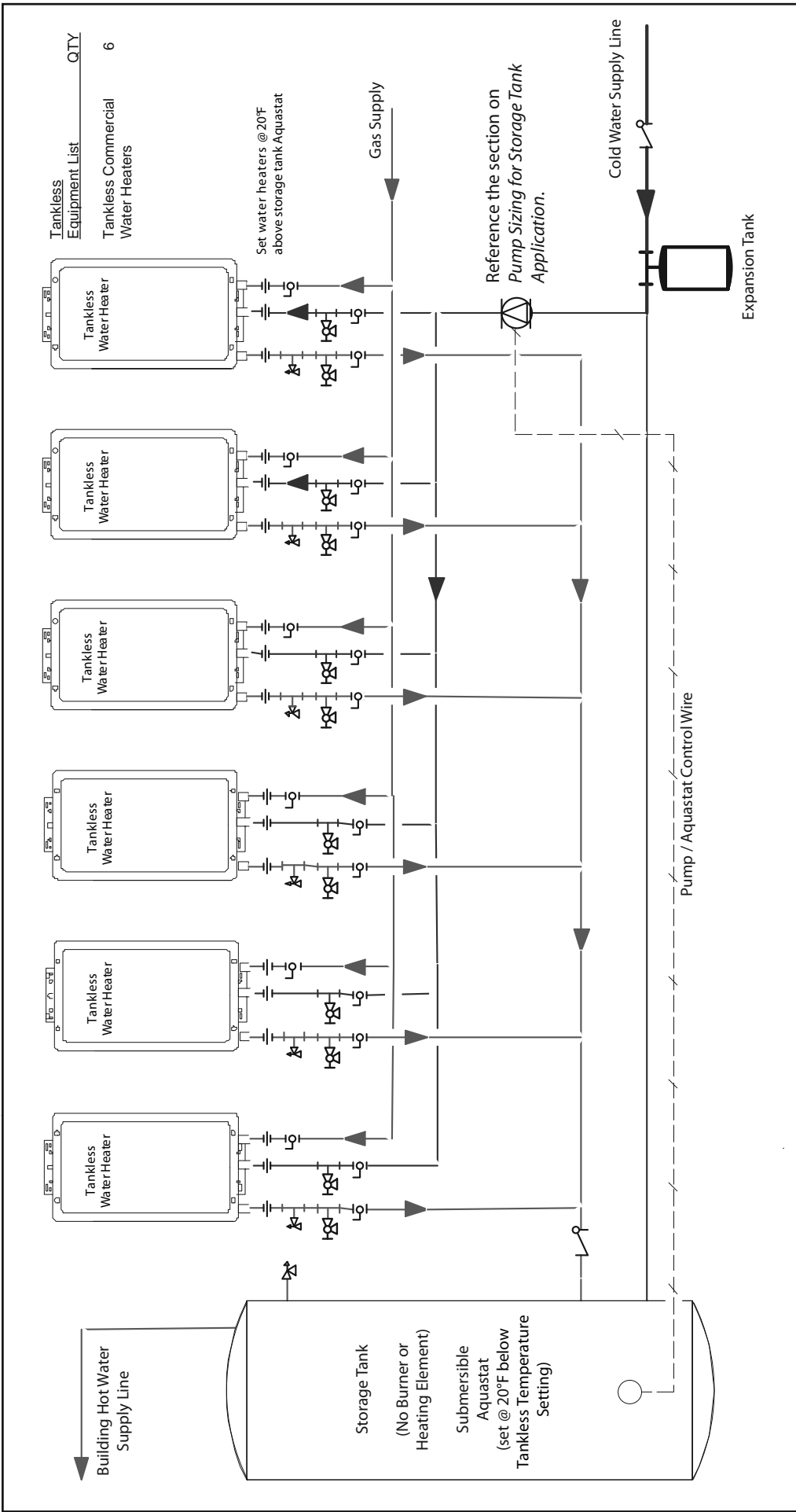
**Domestic Hot Water - Backup Storage / Circulation
3 Tankless Water Heaters
Preferred Piping Installation**

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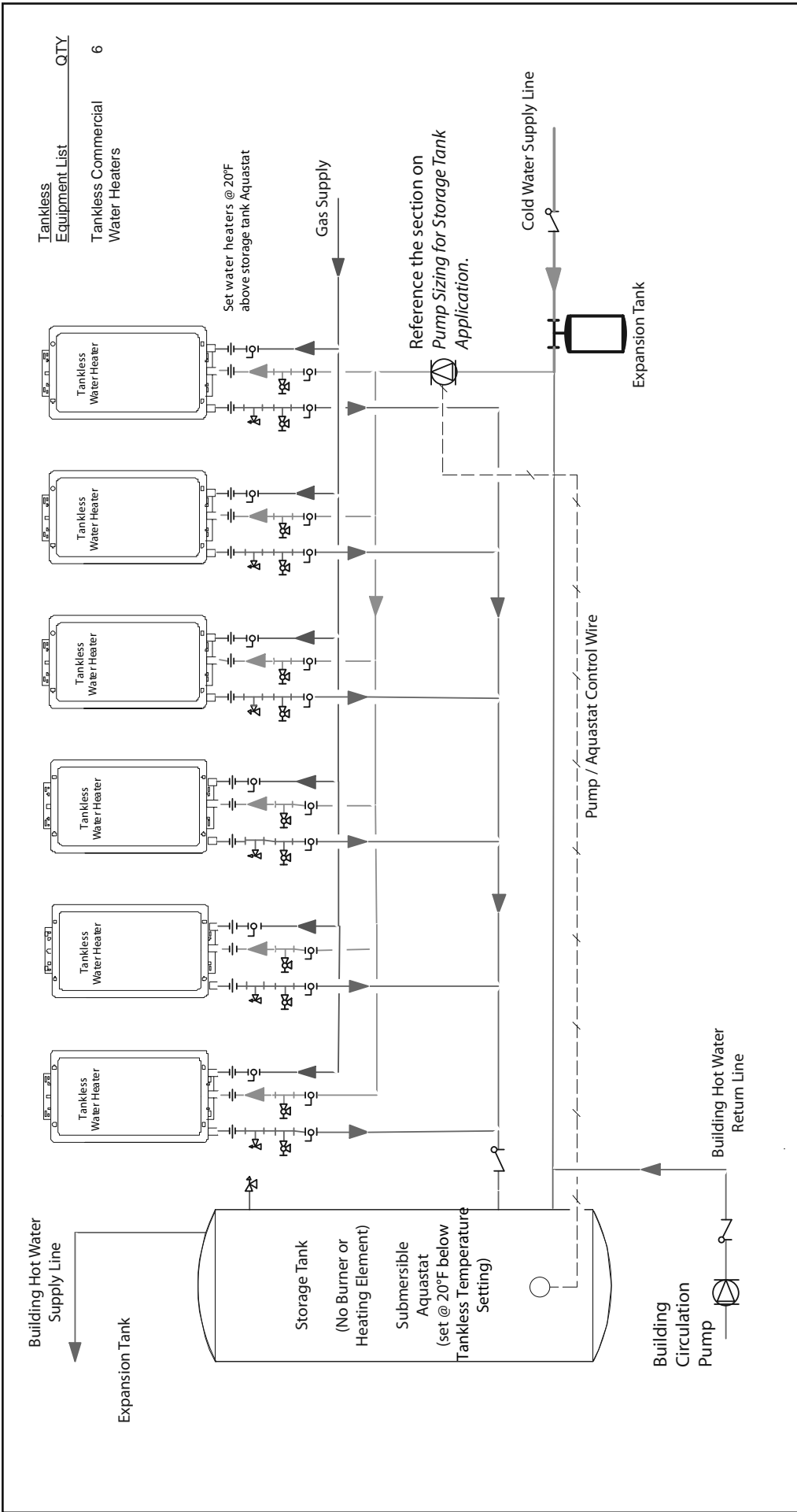
Drawing Number: WH-3-B-R
Drawing Date: February 27, 2008

Key

- 3/4" Ball Valve
- 3/4" Union
- Check Valve
- Pressure Relief Valve
- Pressure Regulator
- Circulating Pump
- Boiler Drain Valve
- Solenoid Valve



<p>Drawing Number: WH-6-B</p>	<p>Domestic Hot Water - Backup Storage 6 Tankless Water Heaters Preferred Piping Installation</p> <p>This is not an engineering drawing; it is intended only as a guide and not as a replacement for professional engineering project drawings. This drawing is not intended to describe a complete system. It is up to the contractor or engineer to determine the necessary components and configuration of the particular system to be installed. The drawing does not imply compliance with local building code requirements. It is the responsibility of the engineer or contractor to ensure that the installation is in accordance with all local building codes. Confer with local building officials before installation.</p>																
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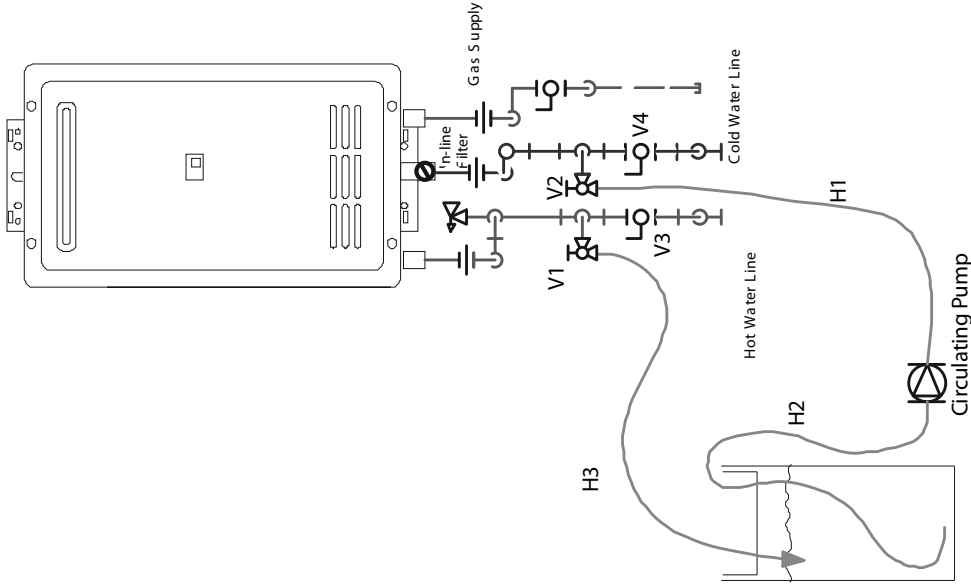
Tankless Equipment List QTY

Tankless Commercial Water Heaters 6

<p>Drawing Number: WH-6-B-R</p>	<p>Domestic Hot Water - Backup Storage / Circulation 6 Tankless Water Heaters Preferred Piping Installation</p>																
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	Pressure Regulator																
	Circulating Pump																
	Boiler Drain Valve																
	Solenoid Valve																

Flush Procedure

1. Disconnect electrical power to the water heater.
2. Close the shutoff valves on both the hot water and cold water lines (V3 and V4).
3. Connect pump outlet hose (H1) to the cold water line at service valve V2.
4. Connect drain hose (H3) to service valve V1.
5. Pour approximately 4 gallons of virgin, food grade, white vinegar or citric acid into pail.
6. Place the drain hose (H3) and the hose (H2) to the pump inlet into the cleaning solution.
7. Open both service valves (V1 and V2) on the hot water and cold water lines.
8. Operate the pump and allow the cleaning solution to circulate through the water heater for at least 45 minutes.
9. Turn off the pump.
10. Rinse the cleaning solution from the water heater by:
 - a. remove the free end of the drain hose (H3) from the pail
 - b. close service valve, V2, and open shutoff valve, V4. Do not open shutoff valve, V3.
 - c. allow water to flow through the water heater for 5 minutes
 - d. close service valve, V1, and open shutoff valve, V3.
11. Disconnect all hoses.
12. Remove the in-line filter at the cold water inlet and clean out any residue. Place filter back into unit.
13. Restore electrical power to the water heater.



Maintenance - Scale Flush Procedure
1 Tankless Water Heater

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Drawing Number:
M-1-F

Drawing Date:
June 11, 2007

Key

- 3/4" Ball Valve
- 3/4" Union
- Check Valve
- Pressure Relief Valve
- Pressure Regulator
- Circulating Pump
- Boiler Drain Valve
- Solenoid Valve

Notes

Notes

• 500 Tennessee Waltz Parkway • Ashland, TN 37015 •